Table 3.5-2
Power Adjustment Factor (PAF)

AUTOMATIC CONTROL DEVICE(S)	STANDARD PAF*
(1) Occupancy sensor	0.30
(2) Daylight Sensing continuous dimming	0.30
(3) Daylight Sensing multiple step dimming	0.20
(4) Daylight Sensing ON/OFF	0.10
(5) Lumen maintenance	0.10

* - Power Adjustment Factor cannot be used for incandescent fixtures.

(a) Programmable for different schedules for occupied and unoccupied days;

(b) Accessible for temporary override by occupants of individual zones, spaces or tasks, with automatic return to the original schedules; and

(c) Capable of keeping time during power outages for a minimum of four hours.

§ 435.104 Auxiliary systems and equipment.

4.1 General

This section contains a few minimum requirements for auxiliary systems and equipment. Because auxiliary systems and equipment vary greatly among buildings, the section is not more comprehensive.

4.2 Principles of Design

4.2.1 Energy recovery should be used when coincident thermal and refrigeration loads of similar magnitude are expected.

4.2.2 Consideration shall be given to the use of waste heat, energy recovery or heat tape systems to conserve energy.

4.3 Minimum Requirements

4.3.1 Transportation Systems.

4.3.1.1 Automatic elevator and/or conveyor systems shall incorporate schedule controls and efficient motor controls, such as solid state control devices.

4.3.2 Freeze Protection System.

4.3.2.1 Boilers or water heaters used for purposes such as freeze protection in fire protection storage vessels and defrosting sidewalks and driveways shall meet the efficiency requirements of sections 8.3 or 9.3 when they operate in excess of 750 hours per year.

4.3.3 Retail Food and Food Service Refrigeration.

4.3.3.1 Refrigeration systems containing multiple compressors shall have compressors sized to optimally match capacity with loads.

4.3.3.2 Variable speed shall be considered.

§ 435.105 Building Envelope.

5.1 General

5.1.1 This section contains requirements for the energy conscious design of building envelopes. It sets principles of good envelope design, and provides a set of minimum requirements and two alternative compliance paths—prescriptive and system performance.

5.1.2 *Compliance.* A building shall be considered in Compliance with this section if the following conditions are met:

5.1.2.1 The minimum requirements of Section 5.3 are met;

5.1.2.2 The design of the building envelope complies with either the prescriptive criteria of section 5.4 or the system performance criteria of section 5.5. For the design of buildings with high internal heat gains, unusual operating schedules, or that incorporate innovative design strategies, consideration shall be given to using the compliance paths set forth in sections 11.0 or 12.0.

5.1.3 The prescriptive compliance alternative of section 5.4 provides requirements for buildings designed to take advantage of perimeter daylighting, thermal mass, high performance glazings, and fenestration shading. The designer is allowed to make trade-offs between thermal mass, wall insulation, amount of fenestration, shading coefficients, shading projections, thermal transmittance of the glazing, daylighting for several different climate locations.

5.1.4 The systems performance compliance alternative of section 3.5 provides calculation procedures that give credit for the benefits of more complex energy conserving envelope designs.

5.1.5 Information on thermal properties, performance of building envelope sections and components, and heat transfer shall be obtained from the *ASHRAE Handbook, 1985 Fundamentals Volume*. When information is not available from this source, the data shall be obtained from laboratory or field test measurements conducted in accordance with *ASTM Standard C–177–85*, ''Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Guarded Hot Plate,'' *ASTM Standard C–518–85*, ''Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter,'' *ASTM Standard C–236–80*, ''Standard Test Method for Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box,'' and *ASTM Standard C–976–82*, ''Thermal Performance of Building Assemblies By Means of a Calibrated Hot Box.''

5.1.6 *Daylighting Credit*. In this section, daylighting credit for reduced energy use resulting from the use of automatic lighting control devices in conjunction with fenestration, is given only for space heating and cooling loads. Credit for the reduced use of electric lighting energy is calculated in section 3.5.6. If daylighting credit for reduced electric lighting energy use is desired to be applied to other building systems, such as more fenestration area, section 11.0 or 12.0 should be used.

5.1.7 The requirements of this section are not intended to replace building loads calculation procedures.

5.2 Principles of Design

5.2.1 Building Loads

5.2.1.1 Building loads result from sources external and internal to the building. (1) External loads, from outdoor temperature, humidity, wind, and insolation, fluctuate daily and seasonally. (2) Internal loads from the activities conducted within the building, including heating and moisture produced by the occupants, lights, and process equipment (e.g., appliances, computers) vary with internal activities. Improving energy efficiency in a building depends on achieving a balance between and among the internal and external loads. The building design should, therefore, offset gains and losses of heat, light, and moisture between the interior and exterior of the building, among interior spaces, and over-time, (daily, seasonally, and annually).

5.2.1.2 This balance of loads can be most efficiently achieved if the building envelope is viewed as, and designed to be, a controlled membrane rather than an immutable barrier. The typical design of a modern building has considered the building envelope to be a fixed barrier that restricts heat and air flow to the maximum extent possible. This will not usually yield the most energy efficient building.

5.2.1.3 The desired goal of the energy design of the building envelope shall be to produce a controlled membrane that allows or prevents heat, light, and moisture flow to achieve a balance between internal and external loads. Thus the envelope becomes an integral part of the building's environmental conditioning systems.

5.2.1.4 To achieve control of the building envelope as a membrane, and to simultaneously achieve occupant comfort in the perimeter zones, many of the traditional building skin components must be used (insulation, mass, caulking and weather stripping). However, other concepts shall also be considered to temper supply air or utilize waste heat in exhaust air to temper envelope conditions, such as operable solar shading devices, and the integration of glazing systems with the HVAC distribution system.

5.2.1.5 Control of External Loads

5.2.1.5.1 Control of Conduction

(a) Controlled conductivity may be considered through the careful use of insulation, sensible (mass) or phase-change storage and movable insulation at levels which minimizes net heating and cooling loads on a time integrated (annual) basis.

(b) Unintentional or uncontrolled thermal bridges shall be minimized and considered in energy related calculations since they can radically alter the conductivity of a building envelope. Examples include wall studs, balconies, ledges, and extensions of building slabs.

5.2.1.5.2 Control of Infiltration (Heat Loss or Gain)

(a) Infiltration shall be minimized and all efforts to achieve a zero level shall be taken. This will minimize fan energy consumption in pressurized buildings during occupied periods and heat loss (or unwanted heat gain in warm climates) during unoccupied periods. Infiltration reduction shall be accomplished through design details that enhance the fit and integrity of building envelope joints in a way that may be readily achieved during building construction. This includes infiltration control by caulking, weather stripping, vestibule doors and/or revolving doors with construction meeting or exceeding accepted specifications.

(b) The quantity of mechanical ventilation must vary with the need, with recommended values at any given time equal to that required by ASHRAE Standard 62–1981. Higher levels of ventilation (e.g., economizers) shall be considered to substitute for mechanical cooling.

(c) Operable windows may be considered to allow for occupant controlled ventilation. When using operable windows, the design of the building's mechanical system must be carefully executed to minimize unnecessary HVAC energy consumption, and building operators must be cautioned about the improper use of the operable windows.

(d) Non-mechanical ventilation can be enhanced in the shape of the building as well as the physical elements of the building envelope, such as cupolas.

(e) For hotels and high rise dwelling units and other systems having exhaust totalling 3000 cfm or more, with annual operation in excess of 3000 hours and within 200 linear ft of simultaneous make-up air equipment, they shall incorporate energy recovery or treatment to ASHRAE 62–1981 quality levels and reuse exhaust air when allowed by code.

5.2.1.5.3 Control of Radiated Heat Losses and Gains

(a) Capability for occupant radiant comfort shall be maintained regardless of whether the building envelope is designed to be a static or dynamic membrane. Opaque surfaces shall be designed so that the *average* inside surface temperatures will remain within 5 °F of room temperature in the coldest anticipated weather (i.e., winter design conditions), and the coldest inside surface will remain within 25 °F of the room temperature.

(b) In a building with time-varying internal heat generation, thermal mass may be considered for controlling radiant comfort. In the perimeter zone, thermal mass is more effective when it is positioned internal to the envelope insulation.

(c) The effective control of solar radiation is critical to the design of energy-efficient buildings due to the high level of internal heat production already present in most commercial building types. In some climates, the lighting energy consumption savings due to daylighting techniques can be greater than the heating and cooling energy penalties from additional glazed surface area, provided that the building envelope is properly designed for daylighting and lighting controls are installed and used. In other climates they may not. Daylighting designs are most effective if direct solar beam radiation is not allowed to cause glare in building spaces.

(d) The transparent portions of the building envelope shall be designed to prevent solar radiant gain above that necessary for effective daylighting and solar heating. On south-facing facades, the use of low shading coefficients is generally not as effective as external physical shading devices in achieving this balance. Light shelves offer a very effective means of admitting daylight while shading the view glazing and simultaneously allowing occupants to manipulate interior shading devices (draperies, blinds) without eliminating day light.

(e) The solar spectrum contains a range of wavelengths including visible and infrared (heat). Designers shall consider which portion of the spectrum to admit into the building. For example, low emissivity, high-visible-transmittance glazings may be considered for the effective control of radiant heat gains and losses. For shading control designers may consider the careful use of vegetation that can block excess gain, year-around or seasonally depending on the plant species chosen.

5.3 Minimum Requirements

5.3.1 Overall Thermal Transmittance (U_o)

5.3.1.1 The overall thermal transmittance of the building envelope above grade assembly shall be calculated as follows:

$$U_o = \sum U_i A_i / A_o = \left(U_1 A_1 \times U_2 A_2 + \cdots + U_n A_n\right) / A_o$$

Equation 5.3–1

Where:

U_o=the area weighted average thermal transmittance of the gross area of the building envelope assembly, e.g., the exterior wall assembly including fenestration and doors; roofs and ceiling assembly; or the floor assembly, Btu/h•ft^2• °F.

A_o=the gross area of the envelope assembly, ft^2.

U_i=the thermal transmittance of each individual path of the envelope assembly (see Section 5.3.2), U_i=1/R_i (where R_1 is the total resistance to heat flow of an individual path through an envelope assembly).

A_i=the area of each individual element of the envelope assembly, ft^2.

5. 3. 2 *Thermal Resistance of Below Grade Components (R)*

5.3.2.1 In calculating the thermal resistance of all below grade components, the thermal performance of the adjacent ground shall be excluded.

5.3.2.2 *Slabs*

5.3.2.2.1 The R-value required for slabs refers only to the insulation materials. Insulative continuity shall be maintained in the design of slab edge insulation systems. Continuity shall be maintained from the wall insulation through the slab/wall/footing intersection to the body of the slab edge insulation.

5.3.2.2.2 Slab-on-grade floors shall have insulation around the perimeter of the floor with the thermal resistance (R_u) of the insulation specified in accordance with Figure 5.5–2. The slab insulation specified shall extend either in a vertical plane downward from the top of the slab for the minimum distance shown or downward to the bottom of the slab then in a horizontal plane beneath the slab or outward from the building for the minimum distance shown. The horizontal length, or vertical depth, of insulation required varies from 24 in. to 48 in. depending upon the R-value selected. For heated slabs, an R of 2 shall be added to the thermal resistance required.

5.3.2.2.3 Vertical insulation shall not be required to extend below the foundation footing. There are no insulation requirements for slabs in locations having less than 3,000 HDD65 or for footings extending less than 18 in. below grade.

5.3.2.2.4 The dimensional requirements for horizontal insulation refers to the insulation materials only. Horizontal applications shall have a thermal break in the slab edge that provides continuity between the wall insulation on the slab and the horizontal insulation.

Below Grade Walls

5.3.2.3.1 The R-value required for Below Grade Walls refers to the overall R-value of the wall assembly excluding air film coefficients and the thermal performance of the adjacent ground.

5.3.3 Thermal Transmittance (U_i) of an Envelope Assembly

5.3.3.1 The thermal transmittance of each envelope assembly shall be determined with due consideration of all major series and parallel heat flow paths through the elements of the assembly. Compression of insulation shall be considered in determining the thermal resistance.

5.3.3.2 The thermal transmittance of opaque assemblies U_i shall be determined using a series path procedure that corrects parallel paths, such as insulation and studs in a wall cavity or the roof assembly shown in Figure 5.3–1. Table 5.3–1 prescribes the procedure to be used for Subsections 5.3.3.2.1 and 5.3.3.2.2.

Figure 5.3-1
Example of Total Resistance of an Envelope Assembly Including Series Resistance and Parallel Path Equivalent Resistance Elements

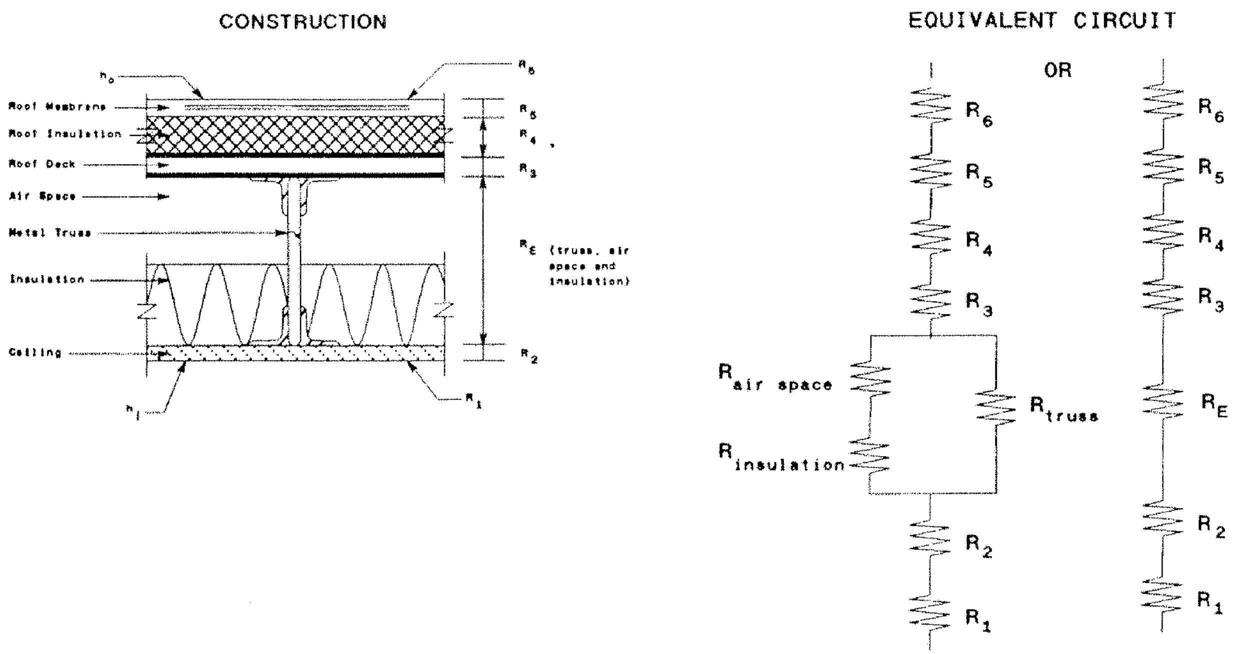


Table 5.3-1

Calculation Procedures for Thermal Transmittance Through Opaque Envelope Assemblies

Material Attached To Thermal Bridge Material	Thermal Bridge Material	Calculation Procedure(s)
Metal	Metal	Thermal Bridges Sheet Metal Construction, 5.3.3.2.1 (d)
Metal	Non-Metal	Parallel/Series 5.3.3.2.2
Non-Metal	Metal	Case Specific Correction 5.3.3.2.1 (b), or 5.3.3.2.1 (c)
Non-Metal	Non-Metal	Parallel/Series 5.3.3.2.2

5.3.3.2.1 For envelope assemblies containing metal framing, the U_i shall be determined by using one of the following methods:

(a) Results from laboratory or field test measurements, using one of the procedures specified in section 5.1.5.

(b) For non-metal surfaces attached to metal framing, where data from tests conducted using procedures specified in section 5.1.5, such as those provided in Tables 5.3–2 and 5.3–3, is available, the total resistance of the series path may be calculated using Equations 5.3–2a and 5.3–2b, and illustrated in Figure 5.3–1:

Table 5.3-2

Parallel Path Correction Factors[1]

Bridged R-Value	0	5	10	15	20	25	30	35	40	45	50	55
Correction Factor	1.0	0.96	0.92	0.88	0.85	0.81	0.79	0.76	0.73	0.71	0.69	0.67

1. Table 5.3-2 values are based upon metal trusses with 4 ft spacing that penetrate the insulation, and 0.66 in. diameter crossmembers every 1 ft.

Table 5.3-3
Wall Sections With Metal Stops
Parallel Path Correction Factors

Size of Members	Gauge of Stud	Spacing of Framing, In.	Cavity Insulation R-Value	Correction Factor
2 X 4	18-16	16 o.c.	R-11	0.50
2 X 4	18-16	24 o.c.	R-11	0.60
2 X 6	18-16	16 o.c.	R-19	0.40
2 X 6	18-16	24 o.c.	R-19	0.45

$$U_i = 1/R_t$$

Equation 5.3–2a

$$R_t = R_i + R_e$$

Equation 5.3–2b

Where:

R_t=the total resistance of the envelope assembly

R_i=the resistance of the series elements (for i=1 to n), excluding the parallel path element(s)

R_e=the equivalent resistance of the element containing the parallel path, the value of R_e is:

R_e=(R-value of insulation)×F_c

Equation 5.3–2c

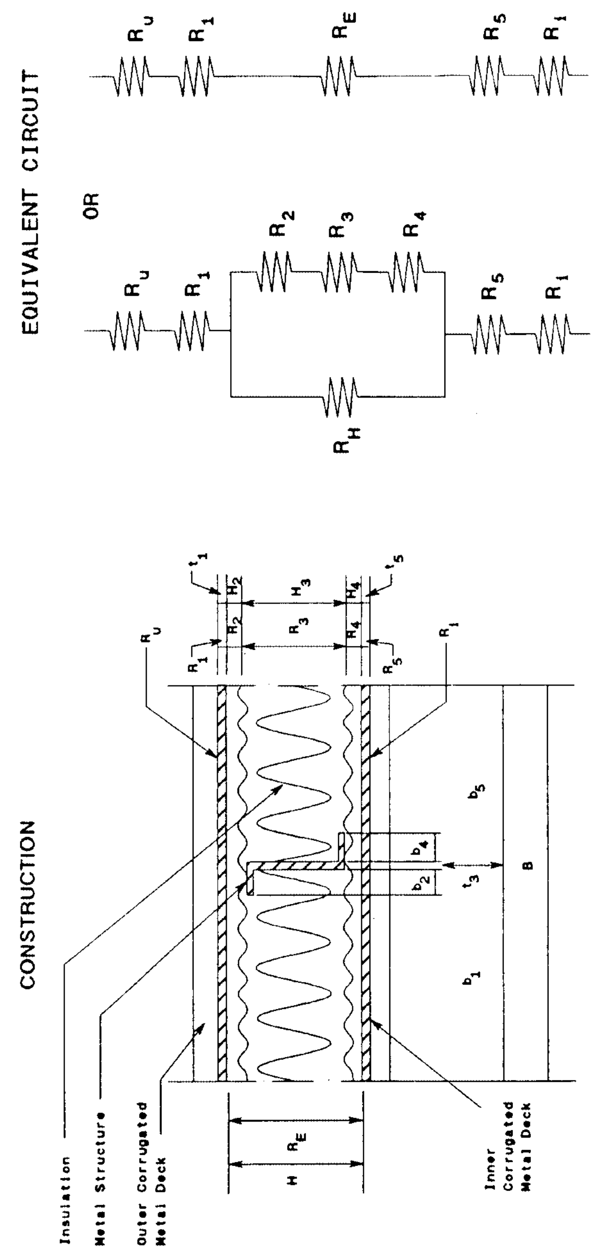
Where:

F_c=the correction factor from Table 5.3–2 or Table 5.3–3.

(c) For elements other than those covered in item (b) above, the zone method described in Chapter 23 of the *ASHRAE Handbook, 1985 Fundamentals Volume* shall be used. The equations on pages 23.13 and 23.14 shall be used.

(d) For sheet metal construction, internally insulated with an internal metal structure bonded on one or both sides to a metal skin or covering (see Figure 5.3–2), the following steps shall be used to calculate the U-value of the envelope construction.

Figure 5.3-2
A Generalized Built-Up Sheet Metal
Construction and Corresponding Resistance Network



(1) First, calculate the resistance of the thermal bridge R_{TB} as follows:

$$R_{TB} = R_1 + R_2 + R_3 + R_4 + R_5$$

(i) Where R_1, the effective mean flow path along the outer metal surface, is calculated by:

$$R_1 = \frac{1}{2 \times L\sqrt{h_1 k_1 T_1}} - \frac{1}{B \times L \times h_1}$$

(ii) And if it occurs, the resistance of insulation (R_2) between the outer metal surface and the metal structural member is calculated by:

$$R_2 = \frac{1}{k \times L\left[\frac{b_2}{H_2} + \frac{2}{\pi}\right]}$$

(iii) And, the resistance of the structural member (R_3) is calculated by:

$$R_3 = \frac{h_3}{L \times t_3 \times k_3}$$

Equation 5.3–6

(iv) And if it occurs, the resistance of insulation (R_4) between the inner metal surface and the purlin flange is calculated by:

$$R_4 = \frac{1}{k \times L\left[\frac{b_4}{H_4} + \frac{2}{\pi}\right]}$$

(v) And finally, the effective mean flow path along the inner metal surface (R_5) is calculated by:

$$R_5 = \frac{1}{2 \times L\sqrt{h_5 k_5 T_5}} - \frac{1}{B \times L \times h_5}$$

Where:
L=total length
h=coefficient of heat transfer
k=thermal conductivity
T=temperature
B=total width
H=partial height
t=thickness of sheet metal

(2) Then calculate the parallel path resistance of the homogeneous insulation R_H as follows:

$$R_H = \frac{\Sigma\left[\frac{H}{K}\right]}{B \times L}$$

(3) Then obtain the overall construction resistance R_C by combining R_H and R_{TB} as two parallel resistances:

$$R_C = \frac{R_{TB} \times R_H}{R_{TB} + R_H}$$

Equation 5.3–10

(4) Then add the inside and outside surface resistances R_i and R_u to get the total resistance $R_{TOT\leq}$

$$R_{TOT} = R_C + R_i + R_u$$

Equation 5.3–11

(5) The total area resistance m_{TOT} is then calculated by:

$$m_{TOT} = R_{TOT} \times B \times L$$

Equation 5.3–12

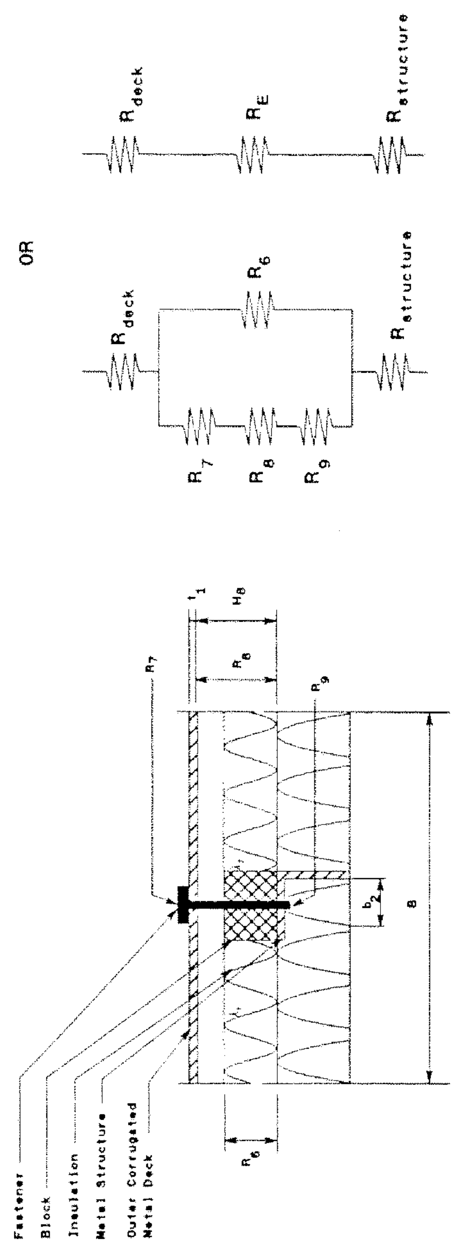
(6) And finally, obtain the U-value by:

$$U = \frac{1}{m_{TOT}}$$

Equation 5.3–13

(7) Where additional resistances are introduced in the construction, introduce them in lieu of the above (R_2 and R_4) resistances. An example of this would be the calculation of both a metallic fastener and a block of higher thermal conductivity material between the outer sheet metal and the internal structural member as shown in Figure 5.3–3. In this case the original R_2 is recalculated by first calculating the thermal bridge R_{2TB} as follows:

Figure 5.3-3
Detail of Heat Transfer From a Metal Surface to a Structure Through a Metal Fastener and Insulating Block With Corresponding Resistance Network



$$R_{2TB} = R_7 + R_8 + R_9$$

Equation 5.3–14

(i) Where the resistance of the heads of number (N) of fasteners per length

(L), adjusting for surface resistance in common with the sheet metal surface, is calculated by:

$$R_7 = \frac{1}{N \times 2 \times \pi \times \lambda_1 \times t_1 \times f\left(\beta r_1, \infty\right)} - \frac{1}{a_1 \times B \times L}$$

Equation 5.3–15

Where:

N=the number of fasteners in Length L

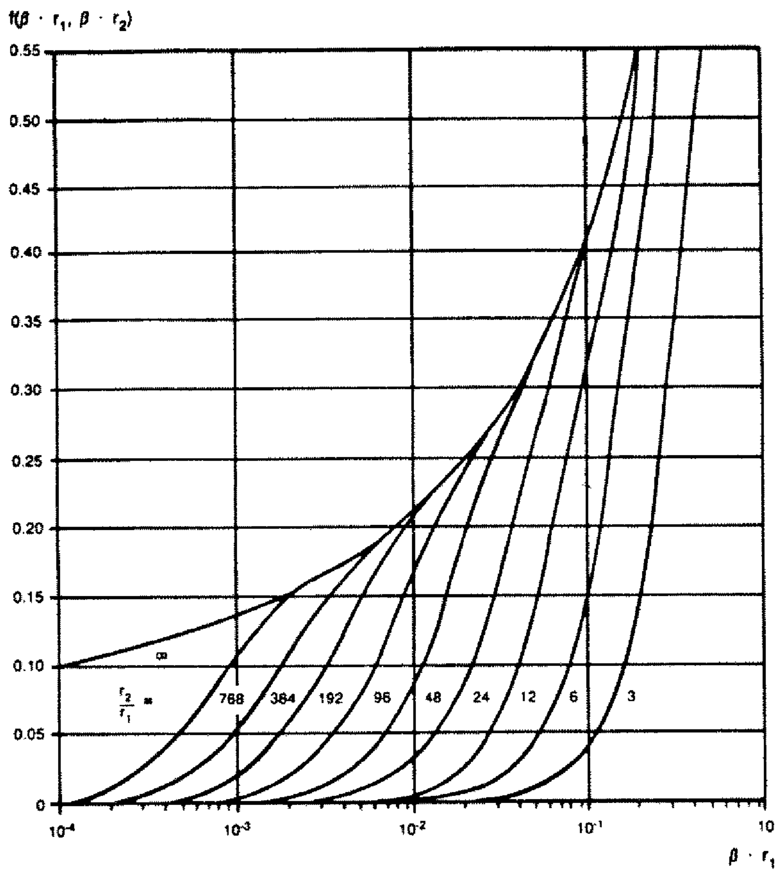
f=the function of B&divide≅ r for different values of the ratio r_2/r_1 given in Figure 5.3–4.

$$\# = \sqrt{} = \frac{\sqrt{h}}{\lambda x t}$$

r_1=the radius of the fastener shank.

r_2=the outer radius of the fastener head.

Figure 5.3-4 – The Function (f) Given as a Function of βr and for Different Values of the Ratio, r_1/r_2



(ii) And, the resistance of the shank of the fastener is calculated by:

$$R_8 = \frac{H_8}{N \times \lambda \times \pi \times r^2{}_1}$$

Equation 5.3–16

(iii) And, finally, the resistance of the connection to the internal structural member is calculated by:

$$R_9 = \frac{1_n \times \frac{b_2}{r_1}}{N \times 2\pi\lambda \times t}$$

(iv) Then calculate the resistance of the block of higher thermal conductivity material as follows:

$$R_6 = \frac{1}{L_1\left[\lambda_1 \frac{b}{H_8} + \lambda_2 \frac{2}{\pi}\right]}$$

Where:

λ1λ2

(v) Then obtain the resistance to be used in lieu of the original R_2 by:

$$R_2 = \frac{R_{TB} \times R_6}{R_{TB} + R_6}$$

Equation 5.3–19

5.3.3.2.2 For envelope assemblies containing Non-Metal Framing, the U_i shall be determined from one of the laboratory or field test measurements specified in Section 5.1.5 or from the ASHRAE series-parallel method. Formulas in Chapter 23, page 23.2 of the *ASHRAE Handbook, 1985 Fundamentals Volume*, shall be used for these calculations.

5.3.3.3 The thermal transmittance of fenestration assemblies shall be corrected to account for the presence of sash, frames, edge effects and spacers in multiple-glazed units.

If thermal transmittances of sash and frames are known, Equation 5.3–1 shall be used, otherwise the thermal transmittance offenestration assemblies shall be calculated as follows:

$U_{of}=\Sigma\ U_{gi}\times F_{f,i}\times A_i/A_{of}=$
$(U_{g,1}\times F_{e,1}\times A_1+U_{g,2\times Ff,2}\times A_2+\ldots$
$+U_{g,n}\times F_{f,n}\times A_n)/A_{of}$

Equation 5.3–20

Where:

A_i=area of i^{th} fenestration assembly

i=numerical subscript (1,2, . . . n) refers to each of the various fenestration assemblies present in the wall

n=the number of fenestration assemblies in the wall assembly.

U_{of}=the overall thermal transmittance of the fenestration assembly, including sash and frames, Btu/h•ft² °F.

U_g=the thermal transmittance of the central area of the fenestration excluding edge effects, spacers in multiple-glazed units, and the sash and frame, Btu/h•ft² °F.

$F_{f,i}$=framing adjustment factor for sash, frames, etc.

A_{of}=the area of all fenestration including glazed portions, sash, frames, etc.

5.3.3.3.1 Values for U_g shall be the winter value obtained from the glazing manufacturer's test data or from Table 13 or Figure 14 of Chapter 27 of the *ASHRAE Handbook, 1985 Fundamentals Volume*. Values for F_f shall be obtained from the frame manufacturer's test data or from the average adjustment factor for a particular product in Table 13, Part C, in Chapter 27 of the *ASHRAE Handbook, 1985 Fundamentals Volume*. For glass products with a U value of 0.45 or less, use the F_f for triple insulated glazing. Alternatively, values of the U_g°F product may be used from manufacturer's test data for open window and frame assemblies tested as a unit provided that the tests referenced edge-effects and windspeed are accounted for winter tested U-values are used.

5.3.4 Gross Area of Envelope Components

5.3.4.1 The gross area of a roof assembly consists of the total surface of the roof assembly exposed to outside air or unconditioned spaces. The roof assembly shall include all roof/ceiling components through which heat may flow between indoor and outdoor environments including skylight surfaces, but excluding service openings.

5.3.4.1.1 For thermal transmittance purposes, when return air ceiling plenums are employed, the roof/ceiling assembly shall not include the thermal resistance of the ceiling, or the plenum space, as part of the total thermal resistance of the assembly.

5.3.4.2 The gross area of a floor assembly over outside or unconditioned space consists of the total surface of the floor assembly exposed to the outside air or an unconditioned space. The floor assembly shall include all floor components through which heat may flow between indoor and outdoor or unconditioned space environments.

5.3.4.3 The gross area of exterior walls enclosing a heated or cooled space is measured on the exterior and consists of the opaque wall including between floor spandrels, peripheral edges of flooring, window areas including sash and door areas, but excluding vents, grilles and pipes.

5.3.5 Shading Coefficients

5.3.5.1 The Shading Coefficient (SC) for fenestration shall be obtained from Chapter 27 of the *ASHRAE Handbook*, *1985 Fundamentals Volume* or from manufacturers' test data. For the prescriptive or system performance envelope compliance calculations in sections 5.4 and 5.5, a factor, SC_x, is used. SC_x is the Shading Coefficient of the fenestration, including internal and external shading devices, but excluding the effect of external shading projections, which is calculated separately. The shading coefficient used for louvered shade screens shall be determined using a profile angle of 30°, as found in Table 41, Chapter 27 of the *ASHRAE Handbook, 1985 Fundamentals Volume.*

5.3.6 Wall Heat Capacity

5.3.6.1 Heat capacity in Btu/ °F•ft^2, shall be determined as the product of the average wall weight in lb/ft^2 and the weighted average specific heat of the wall component in Btu/lb• °F.

5.3.6.2 If the wall system is defined as having exterior insulation only the properties of the wall elements inside of the insulation layer shall be used in determining the wall heat capacity.

5.3.6.3 For walls with integral insulation, all of the elements of the entire wall system may be used in the calculation of the wall heat capacity.

5.3.7 Air Leakage and Moisture Migration

5.3.7.1 The requirements of this subsection apply only to those locations separating the outdoors from interior building conditioned space. Compliance with the criteria for air leakage through building components shall be determined by *ASTM E 283–1984*, ''Standard Method of Test Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors.''

5.3.7.2 Air Leakage Requirements for Fenestration and Doors

5.3.7.2.1 Fenestration meeting the following standards for air leakage is acceptable:

(a) *ANSI/AAMA 101–85*, ''Aluminum Prime Windows.''

(b) *ASTM D–4099–83*, ''Specifications for Poly(VinylChloride) (PVC) Prime Windows.''

(c) *ANSI/NWMA I.S. 2–80*, ''Wood Window Units (Improved Performance Rating Only).''

5.3.7.2.2 Sliding Doors shall meet one of the following standards for air leakage:

(a) *ANSI/AAMA 101–85*, ''Aluminum Sliding Glass Doors.''

(b) *NWMA I.S. 3–83*, ''Wood Sliding Patio Doors.''

5.3.7.2.3 Commercial entrance swinging or revolving doors shall limit air leakage to a rate not to exceed 1.25 cfm/ft^2 of door area, at standard test conditions.

5.3.7.2.4 Residential swinging doors shall limit air leakage to a rate not to exceed 0.5 cfm/ft^2 of door area, at standard test conditions.

5.3.7.2.5 Where spaces have regular high volume traffic through the building envelope, such as retail store entrances and loading bays, estimates of air leakage for HVAC system design shall be based on air exchange by traffic flow.

5.3.7.2.6 To reduce infiltration due to stack-effect draft in multi-story buildings, the use of vestibules or revolving doors on all primary entries and exits shall be considered.

5.3.7.3 Air Leakage Requirements for Exterior Envelope Joints and Penetrations.

5.3.7.3.1 Exterior joints, cracks, and holes in the building envelope, such as those around window or door frames, between wall and foundation, between wall and roof, through wall panels at penetrations of utility services or other service entry through walls, floors, and roofs, between wall panels, particularly at corners and changes in orientation, between wall and floor, where floor penetrates wall, around penetrations of chimney, flue vents, or attic hatches, shall be caulked, gasketed, weather stripped, or otherwise sealed.

5.3.7.4 Moisture Migration Requirements for Exterior Envelopes

5.3.7.4.1 The building envelope shall be designed to prevent moisture migration that leads to deterioration in insulation performance of the building.

5.3.7.4.2 Vapor retarders shall be considered to prevent moisture from collecting within the envelope. Designs should incorporate the principles of *ASHRAE Handbook, 1985 Fundamentals Volume*, Chapter 21, ''Moisture in Building Construction.''

5.3.8 Shell Buildings

5.3.8.1 The following conditions shall be assumed if determination of building envelope compliance occurs prior to the determination of lighting power density, equipment power density, or fenestration shading device characteristics:

5.3.8.1.1 *Lighting Power Density and Equipment Power Density*. For section 5.4, the total power density shall be assumed to be those listed in Table 5.3–4. For section 5.5, the values in Table 5.3–4 shall be assumed to be apportioned as ⅔ lighting and ⅓ for other equipment. Note that these are not recommended design values, but are for compliance purposes only.

Table 5.3-4

Assumed Internal Loads For Shell And Speculative Buildings

	HDD65<3000	3000<HDD65<6000	HDD65>6000
Shell Buildings	3.0 W/Ft^2	2.25 W/ft^2	1.50 W/ft^2
Speculative Buildings	Use the ULPA from Table 3.4-1 and the average equipment power density from Table 5.4-32.		

5.3.8.1.2 *Fenestration shading devices*. Only those shading devices that are part of the design when it is being evaluated for compliance shall be considered when determining compliance.

5.3.8.1.3 *Daylighting controls for electric lighting*. Only those controls that are part of the design when it is being evaluated for compliance shall be considered when determining compliance.

5.3.9 Buildings Located in Climates With Greater Than 15,000 HDD Base 65 °F.

5.3.9.1 For locations with a heating degree-day base (HDD) 65 ° F greater than 15,000, the envelope criteria listed in Table 5.3–5 shall apply, and the window wall ratio (WWR) shall be less than or equal to 0.20.

Table 5.3-5
Requirements For Locations With
Heating Degree-Days Base 65 °F Greater Than 15,000

Envelope Statement	Maximum U Value	Minimum R Value	Notes
U_o opaque wall for buildings with $\geq$ 12,000 ft^2 of gross floor area [1,3]	0.053		See 5.3.3.2
U_o opaque wall for buildings with < 12,000 ft^2 of gross floor area [2,3]	0.040		
U fenestration	0.450		Use Eq 5.3-20
U roof	0.024		
Floor over unconditioned spaces[4]	0.023		See 5.3.3.2
Wall below grade[5]		18	

Slab-on-grade:

Position	Minimum Insulation Distance, in.	Minimum R Value: Unheated Slab	Minimum R Value: Heated Slab
Horizontal	48	15	17
Vertical	48	6	8

Skylights: Not allowed for locations with HDD65 greater than 15,000.

Footnotes for Table 5.3-5:

1. For window to wall ration, WWR $\leq$ 0.20. Shall include corrections for parallel paths within the envelope assembly. For WWR > 0.20, see Footnote (3).
2. For window to wall ratio, WWR $\leq$ 0.15. Shall include corrections for parallel paths within the envelope assembly. For WWR > 0.15, see Footnote (3).
3. The window to wall ratio and the stated U-values for opaque wall and fenestration may be increased or decreased provided that the combined thermal wall transmittance shall not exceed 0.125 for buildings $\geq$ 12,000 ft^2, and 0.091 for buildings < 12,000 ft^2.
4. Including pile-supported floors and elevated floors.
5. Installed on the exterior of perimeter foundation walls for heated foundations.

5.3.10 Daylight Credits for Skylights.

5.3.10.1 Skylights used in conjunction with automatic lighting controls for daylighting can significantly reduce the lighting energy consumption, thereby more than offsetting the increase in envelope heat transfer.

5.3.10.2 When determining building roof compliance, daylight credits for skylights may be used if the criteria of this subsection are met.

5.3.10.3 Skylights for which daylight credit is taken may be excluded from the calculation of the overall thermal transmittance value (U_{or}) of the roof assembly, if all of the following conditions are met:

5.3.10.3.1 The opaque roof thermal transmittance U_{or} value does not exceed the value determined within the selected Alternate Component Package (ACP) table for the prescriptive method or by Equation 5.5–1 for the systems performance method.

5.3.10.3.2 Skylight areas, including framing, as a percentage of the roof area do not exceed the values specified in Tables 5.3–6A and 5.3–6B for building sites located within the climate ranges listed in the two Tables, where Visible Light Transmittance (VLT) is the transmittance of a particular glazing material over the visible portion of the solar spectrum. Skylight areas shall be interpolated between visible light transmittance values of 0.75 and 0.50, only.

Table 5.3-6a
(VLT = 0.75)
Maximum Percent Skylight Area for Given Conditions of Lighting Power Density, Light Level (fc), HDD65 and CDH80

BUILDING LOCATION		LIGHT LEVEL IN (fc)	Range of Lighting Power Density (W/ft^2)				
HDD65	CDH80		<1.00	1.01-1.50	1.51-2.00	2.01-2.50	>2.50
0-3000	0-10000	30	2.3	3.1	3.9	4.7	4.7
		50	3.1	4.3	5.5	6.7	6.7
		70	4.3	5.5	6.7	7.9	7.9
0-3000	>10000	30	2.2	2.8	3.4	4.0	4.0
		50	2.3	3.1	3.9	4.7	4.7
		70	2.9	4.1	5.3	6.5	6.5
>3000	ALL	30	2.3	3.4	4.5	5.6	5.6
		50	2.5	4.0	5.5	7.0	7.0
		70	2.8	4.6	6.4	8.2	8.2

Table 5.3-6b
(VLT = 0.50)
Maximum Percent Skylight Area for Given Conditions of Lighting Power Density, Light Level (fc), HDD65 and CDH80

BUILDING LOCATION		LIGHT LEVEL IN FC	Range of Lighting Power Density (W/ft²)				
HDD65	CDH80		<1.00	1.0-1-1.50	1.51-2.00	2.01-2.50	>2.50
0-3000	0-10000	30	3.6	4.8	6.0	7.2	7.2
		50	4.8	6.6	8.4	10.2	10.2
		70	6.6	8.4	10.2	12.0	12.0
0-3000	>10000	30	3.3	4.2	5.1	6.0	6.0
		50	3.6	4.8	6.0	7.2	7.2
		70	4.2	6.0	7.8	9.6	9.6
>3000	ALL	30	3.6	5.1	6.6	8.1	8.1
		50	3.9	6.0	8.1	10.2	10.2
		70	4.2	6.9	9.6	12.3	12.3

5.3.10.3.3 The skylight area associated with daylight credit can be taken is the area under each skylight whose dimension in each direction (centered on the skylight) is equal to the skylight dimension in that direction plus a distance equal to the floor to ceiling height.

5.3.10.3.4 Skylight areas that overlap areas that have already taken daylight credit (perimeter window areas or other skylight areas) do not again take daylight credit.

5.3.10.3.5 All electric lighting fixtures within skylight areas are controlled by daylight-activated automatic lighting controls.

5.3.10.3.6 For buildings located in climates that have less than 8000 HDD65, the overall thermal transmittance of the skylight assembly, including framing, is less than or equal to 0.7 Btu/h•ft²• °F. For locations greater than 8000 HDD65, the overall thermal transmittance of the skylight assembly, including framing, is less than or equal to 0.45 Btu/h•ft^2• °F.

5.3.10.3.7 Skylight curbs have thermal transmittance (U) values no greater than 0.21 Btu/h•ft^2• °F.

5.3.10.3.8 The infiltration coefficient of the skylights does not exceed 0.05 cfm/ft^2.

5.3.10.4 Skylight areas in Tables 5.3–6A and 5.3–6B may be increased by 50% if a shading device is used that blocks over 50% of the solar gain during the peak cooling design condition.

5.3.10.5 Areas for vertical glazing in clerestories and roof monitors shall be included in the wall fenestration calculation.

5.3.10.6 For shell buildings, the permitted skylight area from Tables 5.3–6A and 5.3–6B shall be based on a light level of 30 fc and a lighting power density (LPD) of less than 1 W/ft^2.

5.3.10.7 For speculative buildings, the permitted skylight area from Tables 5.3–6A and 5.3–6B shall be based on the unit lighting power allowance from Table 3.4–1 and an illuminance level as follows:

5.3.10.7.1 For LPD less than or equal to 1.0 W/ft^2, use 30 fc;

5.3.10.7.2 For LPD greater than 1.0 W/ft^2 and less than 2.5 W/ft^2, use 50 fc; and

5.3.10.7.3 For LPD greater than 2.5 W/ft^2, use 70 fc.

5.3.10.8 Buildings with roof assembly devices that cannot be evaluated under this subsection shall be evaluated using the Building Energy Compliance Methods of Section 11.0 or 12.0.

5.4 Building Envelope—Prescriptive Compliance Alternative

5.4.1 General.

5.4.1.1 This section provides a simple compliance path using precalculated prescriptive requirements for selected exterior envelope configurations of new buildings.

5.4.1.2 The Alternate Component Packages (ACP), found in this subsection, provide design criteria for use with the following options:

5.4.1.2.1 ''Base Case''—buildings with envelopes designed without perimeter daylighting.

5.4.1.2.2 ''Perimeter Daylighting''—buildings with envelopes that use additional fenestration area by incorporating automatic lighting controls in the perimeter zone to permit the use of daylighting in lieu of electric lighting. This ACP is not available for those climates that do not usually require space cooling by means of mechanical refrigeration.

(a) This daylighting credit is in addition to the increased lighting power allowance provided in section 3.5. Some perimeter daylighting options allow a greater proportion of fenestration area due to the increased visible and decreased thermal transmittances of high performance glazings in combination with automatic lighting controls.

5.4.1.3 Each ACP provides a limited number of complying combinations of building variables for a set of climate ranges. The criteria, such as maximum percent fenestration, were calculated using the system performance criteria of section 5.5. Values were chosen from within climate and other variable ranges for the most restrictive results, to ensure compliance of any combination of values within those ranges. Thus, for most climate locations and envelope parameters, the prescriptive criteria may be slightly more stringent than the system performance criteria of section 5.5.

5.4.1.4 Both the base and perimeter daylight cases have two or three fenestration U-value ranges depending on the climate.

5.4.2 Compliance.

5.4.2.1 The envelope design of the building being evaluated is in compliance with the prescriptive criteria of this section provided that:

5.4.2.1.1 The minimum requirements of section 5.3 are met.

5.4.2.1.2 All envelope thermal transmittance (U) values are less than or equal to those chosen from the ACP Table selected for roofs, opaque walls, walls next to unconditioned spaces, and floors over unconditioned spaces.

5.4.2.1.3 The percentage of fenestration of the combined gross wall area is less than or equal to the value permitted for internal load range and glazing in the selected ACP Table.

5.4.2.1.4 Slab-on-grade floors have insulation around the perimeter of the floor with the thermal resistance (R_u) of the insulation as listed in the ACP table. The slab insulation specified shall extend either in a vertical plane downward from the top of the slab for the minimum distance shown or downward to the bottom of the slab then in a horizontal plane beneath the slab or outward from the building for the minimum distance shown. The horizontal length, or vertical depth, of insulation required varies from 24 in. to 48 in. depending upon the R-value selected. For heated slabs, an R of 2 shall be added to the thermal resistance required.

(a) Vertical insulation shall not be required to extend below the foundation footing.

(b) There are no insulation requirements for slabs in locations having less than 3,000 HDD65 or for footings extending less than 18 in. below grade.

5.4.2.1.5 The thermal resistance of the below-grade wall assembly must be greater than or equal to that listed in the ACP table, or the heat loss calculated in accordance with Chapter 25 of the *ASHRAE Handbook, 1985 Fundamentals* shall be less than or equal to that of a wall below grade having a thermal resistance equal to that specified in Figure 5.5–3. No insulation is required for climates with less than 3,000 HDD65 or for those portions of walls more than one story below grade.

5.4.3 Procedure for Using the Alternate Component Packages (ACP).

5.4.3.1 The prescriptive envelope criteria for each of 30 climate ranges are contained in Tables 5.4–2 through 5.4–31.

5.4.3.2 The following steps shall be used to determine compliance with these prescriptive envelope criteria.

5.4.3.2.1 Determine appropriate climate range using either (a) or (b) below.

(a) From Table 5.4–1, select the appropriate ACP Table based on the climate for the building site. The main climate variables that are needed for the proper selection of an ACP Table are cooling degree-days base 65 °F (CDD65), heating degree-days base 50 °F (HDD50), and annual average daily incident of solar radiation on the east or west vertical surface of the facade, Btu/ft^2/day (VSEW). For certain climate ranges this must be augmented by cooling degree-hours base 80 °F (CDH80).

(1) This data, for a specific building location, may be acquired from the U.S. Weather Service of the National Oceanic and Atmospheric Administration or the local weather bureau. The column designated ''ACP Table No.'' in Table 5.4–1 contains the table number of the appropriate ACP Table.

Table 5.4-1
Climate Data Grouped by ACP Tables

ACP Table Number	HDD50 Range	CDD65 Range	VSEW Range	CDH80 Range	Example Cities
5.4-2	0	3001-4500	>800		Barbers Point, Hilo, Honolulu, Lihue
5.4-3	0	>4500	>845		Guantanamo Bay, Kwajalein, San Juan, Wake Island
5.4-4	1-1000	0-1150	560-845		Arcata, North Bend
5.4-5	1-1000	0- 300	>845		Oakland, San Francisco, Santa Maria, Sunnyville
5.4-6	1-1000	301-1150	>845		El Toro, Long Beach, Los Angeles, San Diego
5.4-7	1-1000	1151-2000	560-845		Atlanta, Augusta, Birmingham, Cherry Point, Greenville
5.4-8	1-1000	1151-2000	>845		Fresno, Red Bluff, Sacramento
5.4-9	1-1000	2001-3250	560-845		Charleston, Houston, Jackson, Montgomery, New Orleans
5.4-10	1-1000	2001-3250	>845	0-18000	Austin, Bakersfield, El Paso, Fort Worth, Tallahassee, Tampa
5.4-11	1-1000	2001-3250	>845	>18000	China Lake, Las Vegas, Tucson
5.4-12	1-1000	3251-4500	>845	0-18000	Brownsville, Corpus Christi, Miami, Orlando, West Palm Beach
5.4-13	1-1000	3251-4500	>845	>18000	Loredo, Phoenix, Yuma
5.4-14	1001-1750	0- 500	560-845		Olympia, Portland, Salem, Seattle/Tacoma, Whidbey Island
5.4-15	1001-1750	501-1150	560-845		Asheville, Medford
5.4-16	1001-1750	1-1150	>845		Prescott, Winslow, Yucca
5.4-17	1001-1750	1151-2000	560-845		Charlotte, Chattanooga, Knoxville, Norfolk, Raleigh, Richmond
5.4-18	1001-1750	1151-2000	>845		Albuquerque, Lubbock, Oklahoma City, Roswell, Tucumcari
5.4-19	1001-1750	2001-3250	560-845		Fort Smith, Memphis, Tulsa
5.4-20	1751-2600	0-1150	560-845		Baltimore, Boston, Columbus, Harrisburg, New York, Washington
5.4-21	2601-3200	0-1150	560-845		Akron, Chicago, Detroit, Hartford, Indianapolis, Pittsburgh
5.4-22	1751-3200	0-1150	>845		Boise, Colorado Springs, Denver, Reno, Salt Lake City
5.4-23	1751-3200	1151-2000	560-845		Evansville, Lexington, Louisville, Saint Louis, Springfield
5.4-24	1751-3200	1151-2000	>845		Dodge City, Grand Junction
5.4-25	3201-4000	0-1150	560-845		Albany, Buffalo, Concord, Des Moines, Milwaukee, Rapid City
5.4-26	4001-5000	0-1150	560-845		Bangor, Cutbank, Huron, Minneapolis, Rochester, Sioux Falls
5.4-27	3201-4000	0-1150	>845		Casper, Cheyenne, Ely, North Platte, Scottsbluff
5.4-28	4001-5000	0-1150	>845		Bryce, Eagle, Rock Springs
5.4-29	5001-6500	0-1150	560-845		Bismarck, Duluth, Fargo, Glasgow, International Falls
5.4-30	1-6500	< 100	<560		Adak, Anchorage, Juneau, Kodiak, Yakutat
5.4-31	>6500	< 100	<560		Bethel, Fairbanks, King Salmon, Nome, Summit

ALTERNATE COMPONENT PACKAGES FOR:

HDD50 = 0
CDD65 = 3001 - 4500
VSEW =) 800

Barbers Point HI
Hilo HI
Honolulu HI
Lihue HI

TABLE 5.4-2

INTERNAL LOAD DENSITY (ILD) RANGE	PROJECTION FACTOR (PF)	SHADING COEFF RANGE (SCx)	Uof: BASE CASE 1.15 to 0.82	BASE CASE 0.81 to 0	BASE CASE N/A	PERIMETER DAYLIGHTING 1.15 to 0.82	PERIMETER DAYLIGHTING 0.81 to 0	PERIMETER DAYLIGHTING VLT ≥ SC 0.81 to 0
0 - 1.50	0.000 - 0.249	1.000 - 0.71	17	18		19	19	20
		0.709 - 0.60	21	20		24	24	24
		0.599 - 0.50	25	24		29	28	29
		0.499 - 0.38	31	30		36	34	35
		0.379 - 0.25	41	40		48	46	47
		0.249 - 0.00	67	62		77	72	74
	0.250 - 0.499	1.000 - 0.71	22	21		26	25	26
		0.709 - 0.60	28	27		32	31	32
		0.599 - 0.50	33	32		39	37	39
		0.499 - 0.38	41	39		48	45	47
		0.379 - 0.00	56	52		65	61	63
	0.500 +	1.000 - 0.71	29	28		34	32	33
		0.709 - 0.60	36	35		42	41	42
		0.599 - 0.50	44	42		51	49	50
		0.499 - 0.00	54	51		63	59	61
1.51 - 3.00	0.000 - 0.249	1.000 - 0.71	14	13		22	21	23
		0.709 - 0.60	17	17		28	27	29
		0.599 - 0.50	21	20		33	32	34
		0.499 - 0.38	25	24		41	39	41
		0.379 - 0.25	34	33		55	52	55
		0.249 - 0.00	58	52		85	77	84
	0.250 - 0.499	1.000 - 0.71	18	18		29	28	30
		0.709 - 0.60	23	22		37	35	38
		0.599 - 0.50	28	27		45	42	45
		0.499 - 0.38	34	32		55	51	54
		0.379 - 0.00	46	43		73	68	72
	0.500 +	1.000 - 0.71	24	23		.38	36	39
		0.709 - 0.60	30	29		49	46	49
		0.599 - 0.50	36	34		59	55	58
		0.499 - 0.00	45	42		71	66	70

OPAQUE WALL Uow

ILD 0 - 1.50:

LIGHT WEIGHT WALL: Uow (HC<5)	MASS WALL: HC RANGE	PCT FEN	INT INS	EXT INS
1.00	HC ≥ 5	17	1.00	1.00
	HC ≥ 10	17	1.00	1.00
	HC ≥ 15	17	1.00	1.00
	HC ≥ 5	77	1.00	1.00
	HC ≥ 10	77	1.00	1.00
	HC ≥ 15	77	1.00	1.00

ILD 1.51 - 3.00:

LIGHT WEIGHT WALL: Uow (HC<5)	MASS WALL: HC RANGE	PCT FEN	INT INS	EXT INS
1.00	HC ≥ 5	14	1.00	1.00
	HC ≥ 10	14	1.00	1.00
	HC ≥ 15	14	1.00	1.00
	HC ≥ 5	85	1.00	1.00
	HC ≥ 10	85	1.00	1.00
	HC ≥ 15	85	1.00	1.00

3.01 - 3.50

0.000 - 0.249	1.000 - 0.71	11	10	20	19	22
	0.709 - 0.60	13	13	25	24	27
	0.599 - 0.50	16	16	30	29	32
	0.499 - 0.38	20	19	37	35	39
	0.379 - 0.25	27	28	51	47	53
	0.249 - 0.00	43	40	78	72	80
0.250 - 0.499	1.000 - 0.71	14	14	27	26	29
	0.709 - 0.60	18	17	34	32	36
	0.599 - 0.50	22	21	41	39	43
	0.499 - 0.38	26	25	51	47	52
	0.379 - 0.00	36	34	68	63	69
0.500 +	1.000 - 0.71	18	18	35	33	37
	0.709 - 0.60	23	22	45	42	46
	0.599 - 0.50	28	27	54	50	55
	0.499 - 0.00	35	33	67	61	67

Uow (HC<5)	HC RANGE	PCT FEN	INT INS	EXT INS
1.00	HC ≥ 5	11	1.00	1.00
	HC ≥ 10	11	1.00	1.00
	HC ≥ 15	11	1.00	1.00
	HC ≥ 5	80	1.00	1.00
	HC ≥ 10	80	1.00	1.00
	HC ≥ 15	80	1.00	1.00

Daylight Sensing Controls

	Min R-Value		
WALL BELOW GRADE:	0		
UNHEATED SLAB ON GRADE:	24"	36"	48"
Horizontal	0	0	0
Vertical	0	0	0

	Max Uo
ROOF:	0.084
WALL ADJACENT TO UNCOND SPACE:	1.00
FLOOR OVER UNCOND SPACE:	1.19

ALTERNATE COMPONENT PACKAGES FOR

HDD50 = 0
CDD65 = > 4500
VSEW = > 845

Guantanamo Bay CU
Kwajalein Island
Koror Island
San Juan PR
Wake Island

TABLE 5.4-3

INTERNAL LOAD DENSITY (ILD) RANGE	PROJECTION FACTOR (PF)	SHADING COEFF RANGE (SCx)	Uof — BASE CASE 1.15 to 0.82	BASE CASE 0.81 to 0	BASE CASE N/A	PERIMETER DAYLIGHTING 1.15 to 0.82	PERIMETER DAYLIGHTING 0.81 to 0	PERIMETER DAYLIGHTING 0.81 to 0 (VLT ≥ SC)
0 - 1.50	0.000 - 0.249	1.000 - 0.71	14	14		17	16	17
		0.709 - 0.60	19	18		21	21	22
		0.599 - 0.50	23	22		28	26	28
		0.499 - 0.38	29	28		33	32	33
		0.379 - 0.25	42	39		49	46	47
		0.249 - 0.00	81	72		96	82	85
	0.250 - 0.499	1.000 - 0.71	20	19		23	22	23
		0.709 - 0.60	26	25		30	29	30
		0.599 - 0.50	32	31		37	35	37
		0.499 - 0.38	41	39		48	45	46
		0.379 - 0.00	62	56		73	66	68
	0.500 +	1.000 - 0.71	27	26		31	30	31
		0.709 - 0.60	35	34		41	39	40
		0.599 - 0.50	45	42		53	49	50
		0.499 - 0.00	59	54		70	63	65
1.51 - 3.00	0.000 - 0.249	1.000 - 0.71	12	12		19	19	21
		0.709 - 0.60	18	15		25	24	26
		0.599 - 0.50	19	19		31	30	32
		0.499 - 0.38	24	23		40	38	40
		0.379 - 0.25	35	33		60	54	58
		0.249 - 0.00	66	60		100	93	100
	0.250 - 0.499	1.000 - 0.71	18	18		27	26	28
		0.709 - 0.60	22	21		36	34	36
		0.599 - 0.50	27	26		45	42	45
		0.499 - 0.38	34	32		59	53	57
		0.379 - 0.00	51	47		87	77	82
	0.500 +	1.000 - 6.71	22	22		37	35	38
		0.709 - 0.60	29	28		50	46	49
		0.599 - 0.50	37	35		65	58	61
		0.499 - 0.00	48	45		83	74	78

OPAQUE WALL Uow

ILD 0 - 1.50:

LIGHT WEIGHT WALL: Uow (HC<5)	MASS WALL: HC RANGE	PCT FEN	INT INS	EXT INS
1.00	HC ≥ 5	14	1.00	1.00
	HC ≥ 10	14	1.00	1.00
	HC ≥ 15	14	1.00	1.00
	HC ≥ 5	85	1.00	1.00
	HC ≥ 10	85	1.00	1.00
	HC ≥ 15	85	1.00	1.00

ILD 1.51 - 3.00:

LIGHT WEIGHT WALL: Uow (HC<5)	MASS WALL: HC RANGE	PCT FEN	INT INS	EXT INS
1.00	HC ≥ 5	12	1.00	1.00
	HC ≥ 10	12	1.00	1.00
	HC ≥ 15	12	1.00	1.00
	HC ≥ 5	93	1.00	1.00
	HC ≥ 10	93	1.00	1.00
	HC ≥ 15	93	1.00	1.00

3.01 - 3.50

0.000 - 0.249	1.000 - 0.71	9	9	17	17	19
	0.709 - 0.60	12	12	23	22	25
	0.599 - 0.50	15	14	28	27	31
	0.499 - 0.38	18	18	36	34	38
	0.379 - 0.25	26	25	55	50	55
	0.249 - 0.00	49	46	100	86	98
0.250 - 0.499	1.000 - 0.71	13	12	24	23	27
	0.709 - 0.60	16	16	32	31	34
	0.599 - 0.50	20	20	41	38	43
	0.499 - 0.38	26	25	54	49	54
	0.379 - 0.00	38	36	80	71	78
0.500 +	1.000 - 0.71	17	17	34	32	36
	0.709 - 0.60	22	22	46	42	47
	0.599 - 0.50	28	27	60	54	59
	0.499 - 0.00	38	34	77	69	75

Uow (HC<5)	HC RANGE	PCT FEN	INT INS	EXT INS
1.00	HC ≥ 5	9	1.00	1.00
	HC ≥ 10	9	1.00	1.00
	HC ≥ 15	9	1.00	1.00
	HC ≥ 5	86	1.00	1.00
	HC ≥ 10	86	1.00	1.00
	HC ≥ 15	86	1.00	1.00

Daylight Sensing Controls

	Min R-Value		
WALL BELOW GRADE:	0		
UNHEATED SLAB ON GRADE:	24"	36"	48"
Horizontal	0	0	0
Vertical	0	0	0

	Max Uo
ROOF:	0.057
WALL ADJACENT TO UNCOND SPACE:	1.00
FLOOR OVER UNCOND SPACE:	1.19

ALTERNATE COMPONENT PACKAGES FOR:

HDD50 = 1 - 1000
CDD65 = 0 - 1150
VSEW = 560 - 845

Arcata CA
North Bend OR

TABLE 5.4-4

INTERNAL LOAD DENSITY (ILD) RANGE	PROJECTION FACTOR (PF)	SHADING COEFF RANGE (SCx)	BASE CASE Uof 0.81 to 0.46	BASE CASE Uof 0.45 to 0.39	BASE CASE Uof 0.38 to 0	PERIMETER DAYLIGHTING N/A	PERIMETER DAYLIGHTING VLT ≥ SC
0 - 1.50	0.000 - 0.249	1.000 - 0.71	24	32	33		
		0.709 - 0.60	26	37	39		
		0.599 - 0.50	28	41	45		
		0.499 - 0.38	29	46	51		
		0.379 - 0.25	30	52	59		
		0.249 - 0.00	31	59	70		
	0.250 - 0.499	1.000 - 0.71	27	39	42		
		0.709 - 0.60	29	45	49		
		0.599 - 0.50	30	49	55		
		0.499 - 0.38	30	53	61		
		0.379 - 0.00	31	58	68		
	0.500 +	1.000 - 0.71	30	47	52		
		0.709 - 0.60	31	53	59		
		0.599 - 0.50	31	56	64		
		0.499 - 0.00	31	59	69		
1.51 - 3.00	0.000 - 0.249	1.000 - 0.71	22	27	28		
		0.709 - 0.60	25	33	34		
		0.599 - 0.50	27	37	39		
		0.499 - 0.38	30	42	45		
		0.379 - 0.25	32	50	55		
		0.249 - 0.00	35	60	69		
	0.250 - 0.499	1.000 - 0.71	27	35	36		
		0.709 - 0.60	29	41	43		
		0.599 - 0.50	31	46	49		
		0.499 - 0.38	33	51	56		
		0.379 - 0.00	35	58	65		
	0.500 +	1.000 - 0.71	30	43	45		
		0.709 - 0.60	32	49	53		
		0.599 - 0.50	34	53	59		
		0.499 - 0.00	35	58	66		

OPAQUE WALL Uow

ILD 0 - 1.50:

LIGHT WEIGHT WALL: Uow (HC<5)	MASS WALL: HC RANGE	PCT FEN	INT INS	EXT INS
0.099	HC ≥ 5	24	0.10	0.11
	HC ≥ 10	24	0.12	0.13
	HC ≥ 15	24	0.13	0.14
	HC ≥ 5	70	0.10	0.11
	HC ≥ 10	70	0.11	0.13
	HC ≥ 15	70	0.13	0.14

ILD 1.51 - 3.00:

LIGHT WEIGHT WALL: Uow (HC<5)	MASS WALL: HC RANGE	PCT FEN	INT INS	EXT INS
0.099	HC ≥ 5	22	0.10	0.12
	HC ≥ 10	22	0.13	0.16
	HC ≥ 15	22	0.16	0.19
	HC ≥ 5	69	0.10	0.12
	HC ≥ 10	69	0.12	0.16
	HC ≥ 15	69	0.15	0.18

3.01 - 3.50

0.000 - 0.249	1.000 - 0.71	21	25	26
	0.709 - 0.60	24	31	32
	0.599 - 0.50	27	35	37
	0.499 - 0.38	29	40	43
	0.379 - 0.25	32	48	52
	0.249 - 0.00	36	59	67
0.250 - 0.499	1.000 - 0.71	26	33	34
	0.709 - 0.60	28	38	41
	0.599 - 0.50	31	43	46
	0.499 - 0.38	32	49	53
	0.379 - 0.00	35	56	63
0.500 +	1.000 - 0.71	29	40	42
	0.709 - 0.60	32	46	50
	0.599 - 0.50	33	51	56
	0.499 - 0.00	35	56	63

Uow (HC<5)	HC RANGE	PCT FEN	INT INS	EXT INS
0.099	HC ≥ 5	21	0.10	0.12
	HC ≥ 10	21	0.14	0.18
	HC ≥ 15	21	0.18	0.21
	HC ≥ 5	67	0.10	0.12
	HC ≥ 10	67	0.13	0.17
	HC ≥ 15	67	0.16	0.19

Daylight Sensing Controls

	Min R-Value		
WALL BELOW GRADE:	8		
UNHEATED SLAB ON GRADE:	24"	36"	48"
Horizontal	15	13	10
Vertical	7	6	4

	Max Uo
ROOF:	0.070
WALL ADJACENT TO UNCOND SPACE:	0.15
FLOOR OVER UNCOND SPACE:	0.062

ALTERNATE COMPONENT PACKAGES FOR:

HDD50 = 1 - 1000
CDD65 = 0 - 300
VSEW = > 845

Oakland CA
Point Mugu CA
San Francisco CA
Santa Maria CA
Sunnyvile CA

TABLE 5.4-5

Uof

INTERNAL LOAD DENSITY (ILD) RANGE	PROJECTION FACTOR (PF)	SHADING COEFF RANGE (SCx)	BASE CASE 1.15 to 0.82	BASE CASE 0.81 to 0	BASE CASE N/A	PERIMETER DAYLIGHTING 1.15 to 0.82	PERIMETER DAYLIGHTING 0.81 to 0	PERIMETER DAYLIGHTING 0.45 to 0 (VLT ≥ SC)
0 - 1.50	0.000 - 0.249	1.000 - 0.71	24	26		26	28	29
		0.709 - 0.60	29	31		32	34	38
		0.599 - 0.50	34	38		38	39	43
		0.499 - 0.38	39	43		41	46	51
		0.379 - 0.25	47	54		49	57	66
		0.249 - 0.00	60	72		61	75	96
	0.250 - 0.499	1.000 - 0.71	31	33		33	36	39
		0.709 - 0.60	37	40		39	43	48
		0.599 - 0.50	42	46		44	50	56
		0.499 - 0.38	47	54		50	57	67
		0.379 - 0.00	56	66		58	69	85
	0.500 +	1.000 - 0.71	38	42		41	45	50
		0.709 - 0.60	45	50		47	54	61
		0.599 - 0.50	50	57		52	61	71
		0.499 - 0.00	55	65		57	69	84
1.51 - 3.00	0.000 - 0.249	1.000 - 0.71	19	20		26	27	28
		0.709 - 0.60	24	25		31	33	35
		0.599 - 0.50	28	29		35	38	41
		0.499 - 0.38	32	34		40	45	49
		0.379 - 0.25	40	44		49	58	64
		0.249 - 0.00	54	62		61	74	93
	0.250 - 0.499	1.000 - 0.71	25	26		32	35	37
		0.709 - 0.60	31	32		38	42	46
		0.599 - 0.50	35	38		43	48	54
		0.499 - 0.38	41	44		49	58	65
		0.379 - 0.00	49	56		57	68	83
	0.500 +	1.000 - 0.71	32	33		40	44	48
		0.709 - 0.60	38	41		46	52	59
		0.599 - 0.50	43	47		51	59	70
		0.499 - 0.00	49	55		57	67	82

OPAQUE WALL Uow

ILD 0 - 1.50:

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.15	HC ≥ 5	24	0.21	0.37
	HC ≥ 10	24	0.36	0.50
	HC ≥ 15	24	0.47	0.58
	HC ≥ 5	85	0.21	0.37
	HC ≥ 10	85	0.35	0.49
	HC ≥ 15	85	0.45	0.56

ILD 1.51 - 3.00:

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.15	HC ≥ 5	19	0.28	0.49
	HC ≥ 10	19	0.48	0.72
	HC ≥ 15	19	0.67	0.80
	HC ≥ 5	93	0.20	0.38
	HC ≥ 10	93	0.38	0.53
	HC ≥ 15	93	0.49	0.61

3.01 - 3.50

0.000 - 0.249	1.000 - 0.71	17	17	25	26	27
	0.709 - 0.60	21	21	30	32	34
	0.599 - 0.50	24	25	34	37	40
	0.499 - 0.38	29	30	39	43	48
	0.379 - 0.25	36	39	47	54	63
	0.249 - 0.00	49	56	60	72	90
0.250 - 0.499	1.000 - 0.71	22	23	31	34	36
	0.709 - 0.60	27	28	37	41	45
	0.599 - 0.50	31	33	42	47	53
	0.499 - 0.38	36	39	47	54	63
	0.379 - 0.00	45	50	56	66	81
0.500 +	1.000 - 0.71	28	29	38	42	47
	0.709 - 0.60	34	36	45	50	58
	0.599 - 0.50	38	42	50	57	68
	0.499 - 0.00	44	49	55	65	79

Daylight Sensing Controls

Uow (HC<5)	HC RANGE	PCT FEN	INT INS	EXT INS
0.15	HC ≥ 5	17	0.32	0.53
	HC ≥ 10	17	0.53	0.80
	HC ≥ 15	17	0.74	0.80
	HC ≥ 5	90	0.22	0.39
	HC ≥ 10	90	0.39	0.56
	HC ≥ 15	90	0.52	0.65

	Min R-Value		
WALL BELOW GRADE:	7		
UNHEATED SLAB ON GRADE:	24"	36"	48"
Horizontal	11	9	7
Vertical	6	5	4

	Max Uo
ROOF:	0.089
WALL ADJACENT TO UNCOND SPACE:	0.21
FLOOR OVER UNCOND SPACE:	0.094

ALTERNATE COMPONENT PACKAGES FOR:

HDD50 = 1 - 1000
CDD65 = 301 - 1150
VSEW = > 846

El Toro CA
Long Beach CA
Los Angeles CA
San Diego CA

TABLE 5.4-6

INTERNAL LOAD DENSITY (ILD) RANGE	PROJECTION FACTOR (PF)	SHADING COEFF RANGE (SCx)	BASE CASE Uof 1.15 to 0.82	BASE CASE Uof 0.81 to 0	BASE CASE N/A	PERIMETER DAYLIGHTING Uof 1.15 to 0.82	PERIMETER DAYLIGHTING Uof 0.81 to 0	PERIMETER DAYLIGHTING VLT ≥ SC 0.81 to 0
0 - 1.50	0.000 - 0.249	1.000 - 0.71	18	18		21	21	21
		0.709 - 0.60	23	23		26	26	26
		0.599 - 0.50	27	27		30	31	31
		0.499 - 0.38	33	33		36	37	38
		0.379 - 0.25	43	44		47	49	50
		0.249 - 0.00	64	67		70	73	75
	0.250 - 0.499	1.000 - 0.71	24	24		27	27	28
		0.709 - 0.60	30	30		34	34	35
		0.599 - 0.50	36	36		40	40	41
		0.499 - 0.38	43	43		47	49	50
		0.379 - 0.00	56	57		61	64	65
	0.500 +	1.000 - 0.71	31	32		35	35	36
		0.709 - 0.60	39	39		43	44	45
		0.599 - 0.50	46	47		51	52	53
		0.499 - 0.00	55	56		60	62	64
1.51 - 3.00	0.000 - 0.249	1.000 - 0.71	14	14		21	21	22
		0.709 - 0.60	18	18		26	26	27
		0.599 - 0.50	21	21		31	31	33
		0.499 - 0.38	26	26		37	37	39
		0.379 - 0.25	35	34		49	49	52
		0.249 - 0.00	54	54		72	74	78
	0.250 - 0.499	1.000 - 0.71	19	19		27	27	29
		0.709 - 0.60	24	24		34	34	36
		0.599 - 0.50	28	28		41	41	43
		0.499 - 0.38	34	34		49	49	52
		0.379 - 0.00	46	46		64	65	69
	0.500 +	1.000 - 0.71	25	25		36	36	38
		0.709 - 0.60	31	31		44	44	47
		0.599 - 0.50	37	37		52	53	58
		0.499 - 0.00	45	44		63	64	67

OPAQUE WALL Uow

ILD 0 - 1.50:

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.23	HC ≥ 5	18	0.58	0.80
	HC ≥ 10	18	0.80	0.80
	HC ≥ 15	18	0.80	0.80
	HC ≥ 5	75	0.46	0.80
	HC ≥ 10	75	0.80	0.80
	HC ≥ 15	75	0.80	0.80

ILD 1.51 - 3.00:

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.23	HC ≥ 5	14	0.80	0.80
	HC ≥ 10	14	0.80	0.80
	HC ≥ 15	14	0.80	0.80
	HC ≥ 5	78	0.66	0.80
	HC ≥ 10	78	0.80	0.80
	HC ≥ 15	78	0.80	0.80

3.01 - 3.50

0.000 - 0.249	1.000 - 0.71	12	12	19	19	21
	0.709 - 0.60	15	15	24	24	26
	0.599 - 0.50	18	17	29	29	31
	0.499 - 0.38	21	21	35	35	38
	0.379 - 0.25	29	28	46	46	50
	0.249 - 0.00	45	44	69	70	75
0.250 - 0.499	1.000 - 0.71	16	15	26	25	28
	0.709 - 0.60	20	19	32	32	35
	0.599 - 0.50	23	23	38	38	42
	0.499 - 0.38	28	28	46	46	50
	0.379 - 0.00	38	38	60	61	66
0.500 +	1.000 - 0.71	20	20	33	33	36
	0.709 - 0.60	26	25	41	42	45
	0.599 - 0.50	30	30	49	49	54
	0.499 - 0.00	37	37	59	60	65

Uow (HC<5)	HC RANGE	PCT FEN	INT INS	EXT INS
0.23	HC ≥ 5	12	0.80	0.80
	HC ≥ 10	12	0.80	0.80
	HC ≥ 15	12	0.80	0.80
	HC ≥ 5	75	0.72	0.80
	HC ≥ 10	75	0.80	0.80
	HC ≥ 15	75	0.80	0.80

Daylight Sensing Controls

	Min R-Value		
WALL BELOW GRADE:	0		
UNHEATED SLAB ON GRADE:	24"	36"	48"
Horizontal	0	0	0
Vertical	0	0	0

	Max Uo
ROOF:	0.10
WALL ADJACENT TO UNCOND SPACE:	0.38
FLOOR OVER UNCOND SPACE:	0.18

ALTERNATE COMPONENT PACKAGES FOR.

HDD50 = 1 - 1000
CDD65 = 1151 - 2000
VSEW = 500 - 845

Atlanta GA
Birmingham AL
Cape Hatteras NC
Cherry Point NC
Greenville SC

TABLE 5.4-7

INTERNAL LOAD DENSITY (ILD) RANGE	PROJECTION FACTOR (PF)	SHADING COEFF RANGE (SCx)	Uof: BASE CASE 1.15 to 0.82	BASE CASE 0.81 to 0	BASE CASE N/A	PERIMETER DAYLIGHTING 1.15 to 0.82	PERIMETER DAYLIGHTING 0.81 to 0	PERIMETER DAYLIGHTING 0.81 to 0, VLT ≥ SC
0 - 1.50	0.000 - 0.249	1.000 - 0.71	19	20		21	22	23
		0.709 - 0.60	24	25		26	27	28
		0.599 - 0.50	28	29		30	32	33
		0.499 - 0.38	32	35		35	38	39
		0.379 - 0.25	41	45		44	49	50
		0.249 - 0.00	56	64		59	69	70
	0.250 - 0.499	1.000 - 0.71	25	26		28	29	30
		0.709 - 0.60	30	32		33	36	36
		0.599 - 0.50	35	38		38	42	42
		0.499 - 0.38	41	45		44	49	50
		0.379 - 0.00	50	57		54	61	63
	0.500 +	1.000 - 0.71	31	33		34	37	38
		0.709 - 0.60	38	41		41	45	46
		0.599 - 0.50	43	47		47	52	53
		0.499 - 0.00	49	56		53	60	62
1.51 - 3.00	0.000 - 0.249	1.000 - 0.71	15	15		21	21	23
		0.709 - 0.60	19	19		25	27	28
		0.599 - 0.50	22	22		30	31	33
		0.499 - 0.38	26	27		35	37	39
		0.379 - 0.25	33	35		43	48	51
		0.249 - 0.00	47	52		59	68	71
	0.250 - 0.499	1.000 - 0.71	20	20		27	28	30
		0.709 - 0.60	24	25		33	35	37
		0.599 - 0.50	28	29		38	40	43
		0.499 - 0.38	33	35		43	48	50
		0.379 - 0.00	42	45		53	61	64
	0.500 +	1.000 - 0.71	26	26		34	36	38
		0.709 - 0.60	30	32		40	44	46
		0.599 - 0.50	35	37		46	51	54
		0.499 - 0.00	41	44		52	59	63

OPAQUE WALL Uow

ILD 0 - 1.50:

LIGHT WEIGHT WALL: Uow (HC<5)	MASS WALL: HC RANGE	PCT FEN	INT INS	EXT INS
0.16	HC ≥ 5	19	0.21	0.30
	HC ≥ 10	19	0.31	0.39
	HC ≥ 15	19	0.40	0.42
	HC ≥ 5	70	0.20	0.27
	HC ≥ 10	70	0.27	0.36
	HC ≥ 15	70	0.35	0.39

ILD 1.51 - 3.00:

LIGHT WEIGHT WALL: Uow (HC<5)	MASS WALL: HC RANGE	PCT FEN	INT INS	EXT INS
0.16	HC ≥ 5	15	0.22	0.34
	HC ≥ 10	15	0.36	0.43
	HC ≥ 15	15	0.45	0.47
	HC ≥ 5	71	0.20	0.29
	HC ≥ 10	71	0.29	0.38
	HC ≥ 15	71	0.39	0.40

3.01 - 3.50

0.000 - 0.249	1.000 - 0.71	13	13	20	20	22
	0.709 - 0.60	16	16	24	25	27
	0.599 - 0.50	18	19	28	29	32
	0.499 - 0.38	22	23	33	35	38
	0.379 - 0.25	28	30	41	45	49
	0.249 - 0.00	41	45	55	64	69
0.250 - 0.499	1.000 - 0.71	16	17	25	27	29
	0.709 - 0.60	20	21	31	33	35
	0.599 - 0.50	24	25	35	38	41
	0.499 - 0.38	28	30	41	45	49
	0.379 - 0.00	36	39	50	57	62
0.500 +	1.000 - 0.71	21	22	32	34	36
	0.709 - 0.60	26	27	38	41	45
	0.599 - 0.50	30	32	43	48	52
	0.499 - 0.00	35	38	49	56	61

Daylight Sensing Controls

Uow (HC<5)	HC RANGE	PCT FEN	INT INS	EXT INS
0.16	HC ≥ 5	13	0.22	0.34
	HC ≥ 10	13	0.36	0.43
	HC ≥ 15	13	0.46	0.48
	HC ≥ 5	69	0.20	0.29
	HC ≥ 10	69	0.30	0.39
	HC ≥ 15	69	0.40	0.41

	Min R-Value		
WALL BELOW GRADE:	7		
UNHEATED SLAB ON GRADE:	24"	36"	48"
Horizontal	11	9	7
Vertical	6	5	4

	Max Uo
ROOF:	0.069
WALL ADJACENT TO UNCOND SPACE:	0.21
FLOOR OVER UNCOND SPACE:	0.095

ALTERNATE COMPONENT PACKAGES FOR:

Fresno CA
Redbluff CA
Sacramento CA

TABLE 5.4-8

HDD50 = 1 - 1000
CDD65 = 1151 - 2000
VSEW = > 846

INTERNAL LOAD DENSITY (ILD) RANGE	PROJECTION FACTOR (PF)	SHADING COEFF RANGE (SCx)	Uof: BASE CASE 1.15 to 0.82	Uof: BASE CASE 0.81 to 0	Uof: BASE CASE N/A	Uof: PERIMETER DAYLIGHTING 1.15 to 0.82	Uof: PERIMETER DAYLIGHTING 0.81 to 0	Uof: PERIMETER DAYLIGHTING 0.81 to 0 (VLT ≥ SC)
0 - 1.50	0.000 - 0.249	1.000 - 0.71	19	20		21	22	22
		0.709 - 0.60	24	25		26	27	28
		0.599 - 0.50	28	29		30	32	33
		0.499 - 0.38	33	35		35	38	39
		0.379 - 0.25	41	45		44	49	50
		0.249 - 0.00	56	65		59	69	70
	0.250 - 0.499	1.000 - 0.71	25	26		27	29	29
		0.709 - 0.60	31	33		33	36	36
		0.599 - 0.50	35	38		38	42	42
		0.499 - 0.38	41	45		44	49	50
		0.379 - 0.00	51	58		53	62	63
	0.500 +	1.000 - 0.71	32	34		34	37	38
		0.709 - 0.60	38	42		41	45	46
		0.599 - 0.50	44	48		47	52	53
		0.499 - 0.00	50	57		53	61	62
1.51 - 3.00	0.000 - 0.249	1.000 - 0.71	15	15		20	21	22
		0.709 - 0.60	18	19		25	26	27
		0.599 - 0.50	22	23		29	30	32
		0.499 - 0.38	26	27		34	36	38
		0.379 - 0.25	33	36		42	47	49
		0.249 - 0.00	47	53		58	67	70
	0.250 - 0.499	1.000 - 0.71	20	20		26	28	29
		0.709 - 0.60	24	25		32	34	36
		0.599 - 0.50	28	30		37	40	42
		0.499 - 0.38	33	35		43	47	50
		0.379 - 0.00	42	46		52	60	63
	0.500 +	1.000 - 0.71	25	26		33	35	37
		0.709 - 0.60	31	32		40	43	45
		0.599 - 0.50	35	38		45	50	53
		0.499 - 0.00	41	45		52	59	62

OPAQUE WALL Uow

ILD	LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0 - 1.50	0.16	HC ≥ 5	19	0.28	0.33
		HC ≥ 10	19	0.34	0.44
		HC ≥ 15	19	0.44	0.49
		HC ≥ 5	70	0.19	0.30
		HC ≥ 10	70	0.29	0.40
		HC ≥ 15	70	0.40	0.44
1.51 - 3.00	0.15	HC ≥ 5	15	0.21	0.36
		HC ≥ 10	15	0.37	0.48
		HC ≥ 15	15	0.48	0.53
		HC ≥ 5	70	0.20	0.32
		HC ≥ 10	70	0.32	0.42
		HC ≥ 15	70	0.43	0.47

3.01 - 3.50

0.000 - 0.249	1.000 - 0.71	13	13	19	20	21
	0.709 - 0.60	16	16	23	24	26
	0.599 - 0.50	19	19	27	29	31
	0.499 - 0.38	22	23	32	34	37
	0.379 - 0.25	29	31	40	44	48
	0.249 - 0.00	42	46	55	64	68
0.250 - 0.499	1.000 - 0.71	17	17	25	26	28
	0.709 - 0.60	21	21	30	32	35
	0.599 - 0.50	24	25	35	38	40
	0.499 - 0.38	29	30	40	44	48
	0.379 - 0.00	37	40	50	57	61
0.500 +	1.000 - 0.71	22	22	31	33	36
	0.709 - 0.60	26	28	37	41	44
	0.599 - 0.50	31	33	43	48	51
	0.499 - 0.00	36	39	49	56	60

Uow (HC<5)	HC RANGE	PCT FEN	INT INS	EXT INS
0.15	HC ≥ 5	13	0.21	0.37
	HC ≥ 10	13	0.38	0.48
	HC ≥ 15	13	0.49	0.54
	HC ≥ 5	68	0.20	0.32
	HC ≥ 10	68	0.32	0.43
	HC ≥ 15	68	0.43	0.48

Daylight Sensing Controls

	Min R-Value		
WALL BELOW GRADE:	0		
UNHEATED SLAB ON GRADE:	24"	36"	48"
Horizontal	0	0	0
Vertical	0	0	0

	Max Uo
ROOF:	0.060
WALL ADJACENT TO UNCOND SPACE:	0.23
FLOOR OVER UNCOND SPACE:	0.10

ALTERNATE COMPONENT PACKAGES FOR:

HDD50 = 1 - 1000
CDD65 = 2000 - 3250
VSEW = 560 - 845

Baton Rouge LA
Charleston SC
Columbia SC
Houston TX
Jackson MS

Lake Charles LA
Little Rock AR
Macon GA
Meridian MS
Mobile AL

Montgomery AL
New Orleans LA
Port Angeles TX
Savannah GA
Shreveport LA

TABLE 5.4-9

INTERNAL LOAD DENSITY (ILD) RANGE	PROJECTION FACTOR (PF)	SHADING COEFF RANGE (SCx)	Uof: BASE CASE 1.15 to 0.82	BASE CASE 0.81 to 0	BASE CASE N/A	PERIMETER DAYLIGHTING 1.15 to 0.82	PERIMETER DAYLIGHTING 0.81 to 0	PERIMETER DAYLIGHTING 0.81 to 0 (VLT ≥ SC)
0 - 1.50	0.000 - 0.249	1.000 - 0.71	19	19		21	22	22
		0.709 - 0.60	23	24		26	27	27
		0.599 - 0.50	27	28		30	32	32
		0.499 - 0.38	32	34		36	38	38
		0.379 - 0.25	41	44		45	49	50
		0.249 - 0.00	59	66		63	72	73
	0.250 - 0.499	1.000 - 0.71	24	25		27	28	29
		0.709 - 0.60	30	31		33	35	36
		0.599 - 0.50	35	37		39	41	42
		0.499 - 0.38	41	44		45	49	50
		0.379 - 0.00	52	57		57	63	64
	0.500 +	1.000 - 0.71	31	32		34	36	37
		0.709 - 0.60	38	40		42	45	46
		0.599 - 0.50	44	47		48	52	53
		0.499 - 0.00	51	56		56	62	63
1.51 - 3.00	0.000 - 0.249	1.000 - 0.71	15	15		21	21	23
		0.709 - 0.60	18	18		26	27	28
		0.599 - 0.50	22	22		30	31	33
		0.499 - 0.38	26	27		36	38	40
		0.379 - 0.25	34	35		46	49	52
		0.249 - 0.00	49	53		65	72	76
	0.250 - 0.499	1.000 - 0.71	19	20		27	28	30
		0.709 - 0.60	24	24		33	36	37
		0.599 - 0.50	28	29		39	41	44
		0.499 - 0.38	33	35		46	49	52
		0.379 - 0.00	43	46		58	64	67
	0.500 +	1.000 - 0.71	25	25		35	36	38
		0.709 - 0.60	30	31		42	45	47
		0.599 - 0.50	35	37		49	53	56
		0.499 - 0.00	42	46		57	62	66

OPAQUE WALL Uow

ILD 0 - 1.50:

LIGHT WEIGHT WALL: Uow (HC<5)	MASS WALL: HC RANGE	PCT FEN	INT INS	EXT INS
0.18	HC ≥ 5	19	0.23	0.35
	HC ≥ 10	19	0.35	0.43
	HC ≥ 15	19	0.45	0.47
	HC ≥ 5	73	0.22	0.32
	HC ≥ 10	73	0.33	0.40
	HC ≥ 15	73	0.42	0.44

ILD 1.51 - 3.00:

LIGHT WEIGHT WALL: Uow (HC<5)	MASS WALL: HC RANGE	PCT FEN	INT INS	EXT INS
0.18	HC ≥ 5	15	0.24	0.37
	HC ≥ 10	15	0.39	0.47
	HC ≥ 15	15	0.49	0.52
	HC ≥ 5	76	0.24	0.36
	HC ≥ 10	76	0.38	0.44
	HC ≥ 15	76	0.46	0.48

3.01 - 3.50	0.000 - 0.249	1.000 - 0.71	12	12	19	20	22
		0.709 - 0.60	15	15	24	25	27
		0.599 - 0.50	18	18	28	29	32
		0.499 - 0.38	22	22	33	35	38
		0.379 - 0.25	28	29	43	46	50
		0.249 - 0.00	42	45	61	68	73
	0.250 - 0.499	1.000 - 0.71	16	16	26	26	29
		0.709 - 0.60	20	20	31	33	36
		0.599 - 0.50	23	24	36	39	42
		0.499 - 0.38	28	29	43	46	50
		0.379 - 0.00	36	38	54	60	65
	0.500 +	1.000 - 0.71	21	21	32	34	37
		0.709 - 0.60	25	26	39	42	45
		0.599 - 0.50	30	31	46	49	53
		0.499 - 0.00	35	37	53	59	64

Daylight Sensing Controls

Uow (HC<5)	HC RANGE	PCT FEN	INT INS	EXT INS
0.18	HC ≥ 5	12	0.24	0.37
	HC ≥ 10	12	0.39	0.47
	HC ≥ 15	12	0.49	0.53
	HC ≥ 5	73	0.23	0.36
	HC ≥ 10	73	0.36	0.43
	HC ≥ 15	73	0.45	0.48

	Min R-Value		
WALL BELOW GRADE:	7		
UNHEATED SLAB ON GRADE:	24"	36"	48"
Horizontal	10	9	7
Vertical	6	5	4

	Max Uo
ROOF:	0.064
WALL ADJACENT TO UNCOND SPACE:	0.22
FLOOR OVER UNCOND SPACE:	0.098

ALTERNATE COMPONENT PACKAGES FOR:

HDD50 = 1 - 1000
CDD65 = 2001 - 3250
VSEW = > 845

Abilene TX, Apalachicola FL, Austin TX, Bakersfield CA, Daytona Beach FL, Del Rio TX, El Paso TX, Fort Worth TX, Jacksonville FL, San Antonio TX, Sherman TX, Tallahassee FL, Tampa FL, Waco TX, Wichita Falls TX

TABLE 5.4-10

INTERNAL LOAD DENSITY (ILD) RANGE	PROJECTION FACTOR (PF)	SHADING COEFF RANGE (SCx)	Uof: BASE CASE 1.15 to 0.82	Uof: BASE CASE 0.81 to 0	Uof: BASE CASE N/A	Uof: PERIMETER DAYLIGHTING 1.15 to 0.82	Uof: PERIMETER DAYLIGHTING 0.81 to 0	Uof: PERIMETER DAYLIGHTING 0.81 to 0 (VLT ≥ SC)
0 - 1.50	0.000 - 0.249	1.000 - 0.71	19	19		21	21	22
		0.709 - 0.60	23	24		25	27	27
		0.599 - 0.50	27	28		29	31	32
		0.499 - 0.38	32	34		34	37	38
		0.379 - 0.25	40	44		43	48	49
		0.249 - 0.00	55	64		59	69	70
	0.250 - 0.499	1.000 - 0.71	24	26		27	28	29
		0.709 - 0.60	30	32		32	35	35
		0.599 - 0.50	34	37		37	41	41
		0.499 - 0.38	40	44		43	48	49
		0.379 - 0.00	50	56		53	61	62
	0.500 +	1.000 - 0.71	31	33		34	36	37
		0.709 - 0.60	37	40		40	44	45
		0.599 - 0.50	42	47		46	51	52
		0.499 - 0.00	49	55		52	60	61
1.51 - 3.00	0.000 - 0.249	1.000 - 0.71	15	15		20	21	22
		0.709 - 0.60	18	19		25	26	27
		0.599 - 0.50	21	22		29	31	32
		0.499 - 0.38	25	27		34	37	39
		0.379 - 0.25	33	36		43	48	50
		0.249 - 0.00	47	53		59	68	72
	0.250 - 0.499	1.000 - 0.71	19	20		26	28	29
		0.709 - 0.60	24	25		32	34	36
		0.599 - 0.50	28	29		37	40	42
		0.499 - 0.38	33	35		43	48	50
		0.379 - 0.00	41	46		53	61	64
	0.500 +	1.000 - 0.71	24	26		33	35	37
		0.709 - 0.60	30	32		40	43	46
		0.599 - 0.50	35	37		46	51	53
		0.499 - 0.00	41	44		52	60	63

OPAQUE WALL Uow

ILD 0 - 1.50:

LIGHT WEIGHT WALL: Uow (HC<5)	MASS WALL: HC RANGE	PCT FEN	INT INS	EXT INS
0.15	HC ≥ 5	19	0.17	0.26
	HC ≥ 10	19	0.22	0.32
	HC ≥ 15	19	0.29	0.36
	HC ≥ 5	70	0.17	0.23
	HC ≥ 10	70	0.21	0.30
	HC ≥ 15	70	0.27	0.32

ILD 1.51 - 3.00:

LIGHT WEIGHT WALL: Uow (HC<5)	MASS WALL: HC RANGE	PCT FEN	INT INS	EXT INS
0.15	HC ≥ 5	16	0.17	0.26
	HC ≥ 10	16	0.23	0.36
	HC ≥ 15	16	0.32	0.38
	HC ≥ 5	72	0.17	0.24
	HC ≥ 10	72	0.22	0.32
	HC ≥ 15	72	0.29	0.35

3.01 - 3.50	0.000 - 0.249	1.000 - 0.71	12	13	19	20	21
		0.709 - 0.60	15	16	23	24	26
		0.599 - 0.50	18	19	27	29	31
		0.499 - 0.38	22	23	32	34	37
		0.379 - 0.25	28	30	40	45	48
		0.249 - 0.00	41	45	56	65	70
	0.250 - 0.499	1.000 - 0.71	16	17	25	26	28
		0.709 - 0.60	20	21	30	32	35
		0.599 - 0.50	24	25	35	38	41
		0.499 - 0.38	28	30	40	45	48
		0.379 - 0.00	36	39	50	57	62
	0.500 +	1.000 - 0.71	21	22	31	33	36
		0.709 - 0.60	26	27	37	41	44
		0.599 - 0.50	30	32	43	48	52
		0.499 - 0.00	35	38	49	56	61

Daylight Sensing Controls

Uow (HC<5)	HC RANGE	PCT FEN	INT INS	EXT INS
0.15	HC ≥ 5	12	0.17	0.26
	HC ≥ 10	12	0.23	0.35
	HC ≥ 15	12	0.32	0.38
	HC ≥ 5	70	0.17	0.24
	HC ≥ 10	70	0.22	0.32
	HC ≥ 15	70	0.29	0.36

	Min R-Value		
WALL BELOW GRADE:	7		
UNHEATED SLAB ON GRADE:	24"	36"	48"
Horizontal	10	9	7
Vertical	6	5	4

	Max Uo
ROOF:	0.057
WALL ADJACENT TO UNCOND SPACE:	0.22
FLOOR OVER UNCOND SPACE:	0.100

ALTERNATE COMPONENT PACKAGES FOR:

HDD65 = 1 - 1000
CDD65 = 2001 - 3250
VSEW = > 845
CDH80 = > 10000

China Lake CA
Daggett CA
Las Vegas CA
Tuscon AZ

TABLE 5.4-11

INTERNAL LOAD DENSITY (ILD) RANGE	PROJECTION FACTOR (PF)	SHADING COEFF RANGE (SCx)	BASE CASE Uof 1.15 to 0.82	BASE CASE Uof 0.81 to 0	BASE CASE Uof N/A	PERIMETER DAYLIGHTING 1.15 to 0.82	PERIMETER DAYLIGHTING 0.81 to 0	PERIMETER DAYLIGHTING 0.81 to 0 (VLT ≥ SC)
0 - 1.50	0.000 - 0.249	1.000 - 0.71	17	17		18	19	19
		0.709 - 0.60	21	22		23	23	24
		0.599 - 0.50	25	26		27	28	29
		0.499 - 0.38	30	31		32	34	35
		0.379 - 0.25	39	42		42	45	46
		0.249 - 0.00	59	65		63	70	71
	0.250 - 0.499	1.000 - 0.71	22	23		24	25	26
		0.709 - 0.60	28	29		30	31	32
		0.599 - 0.50	33	34		36	37	38
		0.499 - 0.38	39	42		42	45	46
		0.379 - 0.00	51	56		55	60	61
	0.500 +	1.000 - 0.71	29	30		31	33	33
		0.709 - 0.60	36	38		39	41	42
		0.599 - 0.50	42	46		45	49	50
		0.499 - 0.00	50	54		54	59	60
1.51 - 3.00	0.000 - 0.249	1.000 - 0.71	14	14		18	19	20
		0.709 - 0.60	17	17		23	23	25
		0.599 - 0.50	20	21		27	28	30
		0.499 - 0.38	25	25		33	34	36
		0.379 - 0.25	33	34		43	45	48
		0.249 - 0.00	50	54		65	71	75
	0.250 - 0.499	1.000 - 0.71	18	18		24	25	26
		0.709 - 0.60	23	23		30	31	33
		0.599 - 0.50	27	28		36	37	40
		0.499 - 0.38	33	34		43	46	48
		0.379 - 0.00	43	46		58	61	65
	0.500 +	1.000 - 0.71	24	24		32	33	35
		0.709 - 0.60	29	31		39	41	43
		0.599 - 0.50	35	37		46	49	52
		0.499 - 0.00	42	45		55	60	63

OPAQUE WALL Uow

ILD 0 - 1.50:

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.17	HC ≥ 5	17	0.19	0.24
	HC ≥ 10	17	0.24	0.31
	HC ≥ 15	17	0.29	0.33
	HC ≥ 5	71	0.19	0.24
	HC ≥ 10	71	0.24	0.31
	HC ≥ 15	71	0.29	0.33

ILD 1.51 - 3.00:

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.17	HC ≥ 5	14	0.19	0.26
	HC ≥ 10	14	0.24	0.31
	HC ≥ 15	14	0.30	0.34
	HC ≥ 5	75	0.19	0.26
	HC ≥ 10	75	0.24	0.31
	HC ≥ 15	75	0.30	0.34

3.01 - 3.50

0.000 - 0.249	1.000 - 0.71	12	12	17	17	19
	0.709 - 0.60	15	15	21	22	24
	0.599 - 0.50	17	18	25	26	28
	0.499 - 0.38	21	22	31	32	36
	0.379 - 0.25	28	29	40	43	46
	0.249 - 0.00	44	46	61	67	72
0.250 - 0.499	1.000 - 0.71	15	16	23	23	25
	0.709 - 0.60	20	20	28	29	32
	0.599 - 0.50	23	24	34	35	38
	0.499 - 0.38	28	29	40	43	46
	0.379 - 0.00	37	39	53	58	62
0.500 +	1.000 - 0.71	20	21	30	31	33
	0.709 - 0.60	25	26	37	39	42
	0.599 - 0.50	30	31	44	46	50
	0.499 - 0.00	36	38	52	56	61

Daylight Sensing Controls

Uow (HC<5)	HC RANGE	PCT FEN	INT INS	EXT INS
0.17	HC ≥ 5	12	0.19	0.25
	HC ≥ 10	12	0.24	0.31
	HC ≥ 15	12	0.30	0.34
	HC ≥ 5	72	0.19	0.26
	HC ≥ 10	72	0.25	0.32
	HC ≥ 15	72	0.31	0.35

	Min R-Value		
WALL BELOW GRADE:	0		
UNHEATED SLAB ON GRADE:	24"	36"	48"
Horizontal	0	0	0
Vertical	0	0	0

	Max Uo
ROOF:	0.049
WALL ADJACENT TO UNCOND SPACE:	0.25
FLOOR OVER UNCOND SPACE:	0.12

ALTERNATE COMPONENT PACKAGES FOR:

HDD50 = 1 - 1000
CDD65 = 3261 - 4500
VSEW = > 845
CDH80 = 0 - 18000

Brownsville TX
Corpus Christi TX
Kingsville TX
Miami FL
Orlando FL
West Palm Beach FL

TABLE 5.4-12

Uof

INTERNAL LOAD DENSITY (ILD) RANGE	PROJECTION FACTOR (PF)	SHADING COEFF RANGE (SCx)	BASE CASE 1.15 to 0.82	BASE CASE 0.81 to 0	BASE CASE N/A	PERIMETER DAYLIGHTING 1.15 to 0.82	PERIMETER DAYLIGHTING 0.81 to 0	PERIMETER DAYLIGHTING VLT ≥ SC 0.81 to 0
0 - 1.50	0.000 - 0.249	1.000 - 0.71	15	16		18	17	18
		0.709 - 0.60	20	19		22	22	23
		0.599 - 0.50	24	23		27	27	28
		0.499 - 0.38	29	29		34	33	34
		0.379 - 0.25	41	40		48	46	48
		0.249 - 0.00	74	70		86	80	83
	0.250 - 0.499	1.000 - 0.71	21	20		24	24	24
		0.709 - 0.60	27	26		31	30	31
		0.599 - 0.50	33	32		38	37	38
		0.499 - 0.38	41	40		48	46	47
		0.379 - 0.00	59	57		69	66	67
	0.500 +	1.000 - 0.71	28	27		32	31	32
		0.709 - 0.60	36	35		42	41	42
		0.599 - 0.50	44	43		52	50	51
		0.499 - 0.00	57	54		67	63	65
1.61 - 3.00	0.000 - 0.249	1.000 - 0.71	13	12		19	19	21
		0.709 - 0.60	16	16		25	24	26
		0.599 - 0.50	20	19		31	30	32
		0.499 - 0.38	24	24		38	37	40
		0.379 - 0.25	34	33		55	52	56
		0.249 - 0.00	61	58		97	88	95
	0.250 - 0.499	1.000 - 0.71	17	17		27	26	28
		0.709 - 0.60	22	22		35	34	36
		0.599 - 0.50	27	26		43	41	44
		0.499 - 0.38	34	33		55	52	55
		0.379 - 0.00	49	47		79	73	78
	0.500 +	1.000 - 0.71	23	22		36	35	37
		0.709 - 0.60	30	29		48	46	49
		0.599 - 0.50	37	36		60	57	60
		0.499 - 0.00	47	45		76	71	78

OPAQUE WALL Uow

ILD 0 - 1.50:

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.49	HC ≥ 5	15	0.61	0.76
	HC ≥ 10	15	0.80	0.80
	HC ≥ 15	15	0.80	0.80
	HC ≥ 5	86	0.65	0.80
	HC ≥ 10	86	0.80	0.80
	HC ≥ 15	86	0.80	0.80

ILD 1.61 - 3.00:

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.49	HC ≥ 5	13	0.61	0.78
	HC ≥ 10	13	0.80	0.80
	HC ≥ 15	13	0.80	0.80
	HC ≥ 5	88	0.67	0.80
	HC ≥ 10	88	0.80	0.80
	HC ≥ 15	88	0.80	0.80

3.01 - 3.50	0.000 - 0.249	1.000 - 0.71	10	10	18	17	20
		0.709 - 0.60	13	13	23	22	25
		0.599 - 0.50	16	15	28	27	31
		0.499 - 0.38	19	19	35	34	38
		0.379 - 0.25	27	26	51	48	53
		0.249 - 0.00	48	45	89	81	90
	0.250 - 0.499	1.000 - 0.71	14	13	24	24	27
		0.709 - 0.60	17	17	32	31	34
		0.599 - 0.50	21	21	40	38	42
		0.499 - 0.38	27	26	51	48	53
		0.379 - 0.00	38	37	73	69	75
	0.500 +	1.000 - 0.71	18	18	33	32	36
		0.709 - 0.60	23	23	44	42	46
		0.599 - 0.50	29	28	56	52	57
		0.499 - 0.00	36	35	71	67	72

Daylight Sensing Controls

Uow (HC<5)	HC RANGE	PCT FEN	INT INS	EXT INS
0.49	HC ≥ 5	10	0.61	0.76
	HC ≥ 10	10	0.80	0.80
	HC ≥ 15	10	0.80	0.80
	HC ≥ 5	90	0.67	0.80
	HC ≥ 10	90	0.80	0.80
	HC ≥ 15	90	0.80	0.80

	Min R-Value		
WALL BELOW GRADE:	0		
UNHEATED SLAB ON GRADE:	24"	36"	48"
Horizontal	0	0	0
Vertical	0	0	0

	Max Uo
ROOF:	0.064
WALL ADJACENT TO UNCOND SPACE:	0.63
FLOOR OVER UNCOND SPACE:	0.28

ALTERNATE COMPONENT PACKAGES FOR:

HDD50 = 1 - 1000
CDD65 = 3250 - 4500
VSEW = > 845
CDH80 = > 18000

Laredo TX
Phoenix AZ
Yuma AZ

TABLE 5.4-13

INTERNAL LOAD DENSITY (ILD) RANGE	PROJECTION FACTOR (PF)	SHADING COEFF RANGE (SCx)	BASE CASE Uof 1.15 to 0.82	BASE CASE Uof 0.81 to 0	BASE CASE Uof N/A	PERIMETER DAYLIGHTING Uof 1.15 to 0.82	PERIMETER DAYLIGHTING Uof 0.81 to 0	PERIMETER DAYLIGHTING Uof 0.81 to 0 (VLT ≥ SC)
0 - 1.50	0.000 - 0.249	1.000 - 0.71	15	15		17	17	17
		0.709 - 0.60	19	19		22	21	22
		0.599 - 0.50	23	23		27	26	27
		0.499 - 0.38	29	28		33	33	34
		0.379 - 0.25	41	40		47	46	48
		0.249 - 0.00	75	72		88	83	85
	0.250 - 0.499	1.000 - 0.71	20	20		23	23	24
		0.709 - 0.60	26	26		30	30	30
		0.599 - 0.50	32	31		37	36	37
		0.499 - 0.38	40	40		47	46	47
		0.379 - 0.00	59	57		69	66	68
	0.500 +	1.000 - 0.71	27	27		31	31	32
		0.709 - 0.60	35	35		41	40	41
		0.599 - 0.50	44	43		51	50	51
		0.499 - 0.00	56	55		67	64	66
1.51 - 3.00	0.000 - 0.249	1.000 - 0.71	12	12		19	19	20
		0.709 - 0.60	16	16		24	24	26
		0.599 - 0.50	19	19		30	29	32
		0.499 - 0.38	24	24		38	37	40
		0.379 - 0.25	34	33		55	53	57
		0.249 - 0.00	62	59		100	92	100
	0.250 - 0.499	1.000 - 0.71	17	17		26	26	28
		0.709 - 0.60	22	21		34	33	36
		0.599 - 0.50	27	26		42	41	44
		0.499 - 0.38	34	33		55	52	56
		0.379 - 0.00	49	47		80	75	81
	0.500 +	1.000 - 0.71	23	22		36	35	37
		0.709 - 0.60	29	29		47	46	49
		0.599 - 0.50	36	36		60	57	61
		0.499 - 0.00	47	45		77	73	78

OPAQUE WALL Uow

ILD 0 - 1.50:

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.35	HC ≥ 5	15	0.41	0.50
	HC ≥ 10	15	0.51	0.59
	HC ≥ 15	15	0.59	0.62
	HC ≥ 5	88	0.43	0.54
	HC ≥ 10	88	0.56	0.66
	HC ≥ 15	88	0.65	0.69

ILD 1.51 - 3.00:

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.35	HC ≥ 5	12	0.41	0.50
	HC ≥ 10	12	0.51	0.59
	HC ≥ 15	12	0.59	0.62
	HC ≥ 5	92	0.43	0.54
	HC ≥ 10	92	0.56	0.66
	HC ≥ 15	92	0.66	0.70

3.01 - 3.50

0.000 - 0.249	1.000 - 0.71	10	10	17	17	19
	0.709 - 0.60	13	12	22	22	25
	0.599 - 0.50	15	15	27	27	30
	0.499 - 0.38	19	19	34	34	38
	0.379 - 0.25	27	26	51	49	54
	0.249 - 0.00	48	46	91	84	95
0.250 - 0.499	1.000 - 0.71	13	13	24	23	26
	0.709 - 0.60	17	17	31	30	34
	0.599 - 0.50	21	21	39	38	42
	0.499 - 0.38	27	26	50	48	53
	0.379 - 0.00	38	37	74	70	77
0.500 +	1.000 - 0.71	18	17	33	32	35
	0.709 - 0.60	23	23	43	42	46
	0.599 - 0.50	29	28	55	53	58
	0.499 - 0.00	37	36	72	68	74

Uow (HC<5)	HC RANGE	PCT FEN	INT INS	EXT INS
0.35	HC ≥ 5	10	0.41	0.49
	HC ≥ 10	10	0.50	0.58
	HC ≥ 15	10	0.58	0.61
	HC ≥ 5	91	0.42	0.53
	HC ≥ 10	91	0.55	0.65
	HC ≥ 15	91	0.65	0.69

Daylight Sensing Controls

	Min R-Value		
WALL BELOW GRADE:	0		
UNHEATED SLAB ON GRADE:	24"	36"	48"
Horizontal	0	0	0
Vertical	0	0	0

	Max Uo
ROOF:	0.045
WALL ADJACENT TO UNCOND SPACE:	0.42
FLOOR OVER UNCOND SPACE:	0.20

ALTERNATE COMPONENT PACKAGES FOR:

HDD50 = 1001 - 1750
CDD65 = 0 - 500
VSEW = 500 - 845

Astoria OR
Olympia WA
Portland OR
Salem OR
Seattle WA

Whidbey Island WA

TABLE 5.4-14

INTERNAL LOAD DENSITY (ILD) RANGE	PROJECTION FACTOR (PF)	SHADING COEFF RANGE (SCx)	Uof — BASE CASE 0.81 to 0.46	BASE CASE 0.45 to 0.39	BASE CASE 0.38 to 0	PERIMETER DAYLIGHTING N/A	VLT ≥ SC
0 - 1.50	0.000 - 0.249	1.000 - 0.71	24	31	33		
		0.709 - 0.60	26	37	39		
		0.599 - 0.50	27	41	44		
		0.499 - 0.38	29	45	50		
		0.379 - 0.25	30	52	59		
		0.249 - 0.00	32	59	70		
	0.250 - 0.499	1.000 - 0.71	27	39	41		
		0.709 - 0.60	29	44	48		
		0.599 - 0.50	30	48	54		
		0.499 - 0.38	31	53	60		
		0.379 - 0.00	32	58	67		
	0.500 +	1.000 - 0.71	29	46	50		
		0.709 - 0.60	31	51	58		
		0.599 - 0.50	32	55	63		
		0.499 - 0.00	32	58	68		
1.51 - 3.00	0.000 - 0.249	1.000 - 0.71	22	27	28		
		0.709 - 0.60	25	32	34		
		0.599 - 0.50	27	37	39		
		0.499 - 0.38	29	42	45		
		0.379 - 0.25	32	49	54		
		0.249 - 0.00	35	60	69		
	0.250 - 0.499	1.000 - 0.71	28	34	36		
		0.709 - 0.60	29	40	43		
		0.599 - 0.50	30	45	49		
		0.499 - 0.38	32	50	55		
		0.379 - 0.00	34	57	65		
	0.500 +	1.000 - 0.71	29	42	45		
		0.709 - 0.60	32	48	52		
		0.599 - 0.50	33	52	58		
		0.499 - 0.00	34	57	64		

OPAQUE WALL Uow

ILD 0 - 1.50:

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.096	HC ≥ 5	24	0.10	0.15
	HC ≥ 10	24	0.11	0.19
	HC ≥ 15	24	0.12	0.24
	HC ≥ 5	70	0.10	0.14
	HC ≥ 10	70	0.11	0.19
	HC ≥ 15	70	0.12	0.23

ILD 1.51 - 3.00:

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.096	HC ≥ 5	22	0.10	0.17
	HC ≥ 10	22	0.12	0.23
	HC ≥ 15	22	0.13	0.28
	HC ≥ 5	60	0.10	0.16
	HC ≥ 10	60	0.11	0.22
	HC ≥ 15	60	0.13	0.27

3.01 - 3.50

0.000 - 0.249	1.000 - 0.71	21	25	26
	0.709 - 0.60	24	30	31
	0.599 - 0.50	26	34	36
	0.499 - 0.38	28	39	42
	0.379 - 0.25	31	47	51
	0.249 - 0.00	35	58	66
0.250 - 0.499	1.000 - 0.71	25	32	33
	0.709 - 0.60	28	38	40
	0.599 - 0.50	30	42	46
	0.499 - 0.38	32	48	52
	0.379 - 0.00	34	55	62
0.500 +	1.000 - 0.71	28	39	42
	0.709 - 0.60	31	45	49
	0.599 - 0.50	33	50	55
	0.499 - 0.00	34	55	61

Uow (HC<5)	HC RANGE	PCT FEN	INT INS	EXT INS
0.096	HC ≥ 5	21	0.10	0.17
	HC ≥ 10	21	0.12	0.24
	HC ≥ 15	21	0.14	0.30
	HC ≥ 5	66	0.10	0.17
	HC ≥ 10	66	0.11	0.23
	HC ≥ 15	66	0.13	0.29

Daylight Sensing Controls

	Min R-Value		
WALL BELOW GRADE:	9		
UNHEATED SLAB ON GRADE:	24"	36"	48"
Horizontal	16	13	10
Vertical	7	6	4

	Max Uo
ROOF:	0.064
WALL ADJACENT TO UNCOND SPACE:	0.14
FLOOR OVER UNCOND SPACE:	0.057

ALTERNATE COMPONENT PACKAGES FOR: Asheville NC, Medford OR — TABLE 5.4-15

HDD50 = 1001 - 1750
CDD65 = 501 - 1150
VSEW = 560 - 845

INTERNAL LOAD DENSITY (ILD) RANGE	PROJECTION FACTOR (PF)	SHADING COEFF RANGE (SCx)	Uof BASE CASE 0.81 to 0.46	BASE CASE 0.45 to 0.39	BASE CASE 0.38 to 0	PERIMETER DAYLIGHTING 0.81 to 0.46	PERIMETER DAYLIGHTING 0.45 to 0	PERIMETER DAYLIGHTING 0.38 to 0 (VLT ≥ SC)
0 - 1.50	0.000 - 0.249	1.000 - 0.71	20	24	25	22	26	27
		0.709 - 0.60	24	29	30	25	31	33
		0.599 - 0.50	26	34	35	27	36	38
		0.499 - 0.38	29	39	41	30	41	44
		0.379 - 0.25	33	47	51	33	50	55
		0.249 - 0.00	38	61	69	38	63	72
	0.250 - 0.499	1.000 - 0.71	25	31	32	26	33	35
		0.709 - 0.60	28	37	39	29	40	42
		0.599 - 0.50	31	42	45	31	45	49
		0.499 - 0.38	33	48	52	34	50	56
		0.379 - 0.00	36	57	63	37	59	67
	0.500 +	1.000 - 0.71	29	39	41	30	41	45
		0.709 - 0.60	32	46	49	33	48	53
		0.599 - 0.50	34	51	56	35	53	60
		0.499 - 0.00	36	57	63	37	59	67
1.51 - 3.00	0.000 - 0.249	1.000 - 0.71	18	20	20	22	27	28
		0.709 - 0.60	21	25	25	26	32	34
		0.599 - 0.50	24	29	30	29	37	40
		0.499 - 0.38	27	34	35	32	43	46
		0.379 - 0.25	32	42	45	36	52	58
		0.249 - 0.00	39	58	63	41	67	77
	0.250 - 0.499	1.000 - 0.71	22	26	27	27	34	36
		0.709 - 0.60	26	32	33	31	41	44
		0.599 - 0.50	29	37	39	33	46	51
		0.499 - 0.38	32	43	45	36	53	59
		0.379 - 0.00	37	53	57	40	62	71
	0.500 +	1.000 - 0.71	27	33	34	31	43	46
		0.709 - 0.60	31	40	42	35	50	55
		0.599 - 0.50	33	46	48	37	56	63
		0.499 - 0.00	36	52	56	39	62	71

OPAQUE WALL Uow

ILD 0 - 1.50:

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.10	HC ≥ 5	20	0.11	0.15
	HC ≥ 10	20	0.13	0.19
	HC ≥ 15	20	0.16	0.20
	HC ≥ 5	72	0.11	0.14
	HC ≥ 10	72	0.13	0.17
	HC ≥ 15	72	0.14	0.18

ILD 1.51 - 3.00:

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.10	HC ≥ 5	18	0.11	0.17
	HC ≥ 10	18	0.14	0.22
	HC ≥ 15	18	0.18	0.24
	HC ≥ 5	77	0.11	0.16
	HC ≥ 10	77	0.13	0.19
	HC ≥ 15	77	0.15	0.20

3.01 - 3.50	0.000 - 0.249	1.000 - 0.71	16	18	18	22	26	27
		0.709 - 0.60	19	22	22	25	31	33
		0.599 - 0.50	22	25	26	28	36	39
		0.499 - 0.38	25	30	31	31	42	45
		0.379 - 0.25	29	38	40	35	51	57
		0.249 - 0.00	36	52	57	40	65	75
	0.250 - 0.499	1.000 - 0.71	20	23	23	26	33	35
		0.709 - 0.60	24	28	29	30	40	43
		0.599 - 0.50	26	33	34	32	45	50
		0.499 - 0.38	29	38	40	35	51	58
		0.379 - 0.00	34	47	51	39	61	70
	0.500 +	1.000 - 0.71	24	29	30	31	41	45
		0.709 - 0.60	28	35	37	34	48	54
		0.599 - 0.50	31	41	43	36	54	61
		0.499 - 0.00	34	47	50	38	60	70

Uow (HC<5)	HC RANGE	PCT FEN	INT INS	EXT INS
0.10	HC ≥ 5	10	0.11	0.17
	HC ≥ 10	10	0.15	0.23
	HC ≥ 15	10	0.18	0.26
	HC ≥ 5	75	0.11	0.15
	HC ≥ 10	75	0.13	0.19
	HC ≥ 15	75	0.15	0.20

Daylight Sensing Controls

	Min R-Value		
WALL BELOW GRADE:	8		
UNHEATED SLAB ON GRADE:	24"	36"	48"
Horizontal	15	12	10
Vertical	7	5	4

	Max Uo
ROOF:	0.063
WALL ADJACENT TO UNCOND SPACE:	0.10
FLOOR OVER UNCOND SPACE:	0.064

ALTERNATE COMPONENT PACKAGES FOR:

HDD50 = 1001 - 1750
CDD65 = 1 - 1150
VSEW = > 845

Prescott AZ
Winslow AZ
Yucca Flats NV

TABLE 5.4-16

INTERNAL LOAD DENSITY (ILD) RANGE	PROJECTION FACTOR (PF)	SHADING COEFF RANGE (SCx)	BASE CASE Uof 0.81 to 0.46	BASE CASE Uof 0.45 to 0.39	BASE CASE Uof 0.38 to 0	PERIMETER DAYLIGHTING Uof 0.81 to 0.46	PERIMETER DAYLIGHTING Uof 0.45 to 0	PERIMETER DAYLIGHTING Uof 0.38 to 0 (VLT ≥ SC)
0 - 1.50	0.000 - 0.249	1.000 - 0.71	15	17	17	17	19	19
		0.709 - 0.60	18	21	21	20	23	24
		0.599 - 0.50	21	24	25	22	27	28
		0.499 - 0.38	24	29	30	25	31	33
		0.379 - 0.25	28	36	38	29	39	42
		0.249 - 0.00	35	50	54	36	53	58
	0.250 - 0.499	1.000 - 0.71	19	22	23	21	25	26
		0.709 - 0.60	23	27	28	24	30	31
		0.599 - 0.50	25	32	33	27	34	37
		0.499 - 0.38	28	37	39	30	40	43
		0.379 - 0.00	33	46	49	34	48	53
	0.500 +	1.000 - 0.71	24	29	30	25	31	33
		0.709 - 0.60	27	34	36	28	37	40
		0.599 - 0.50	30	39	42	31	42	46
		0.499 - 0.00	33	45	49	34	48	53
1.51 - 3.00	0.000 - 0.249	1.000 - 0.71	13	13	14	17	18	20
		0.709 - 0.60	15	17	17	20	23	25
		0.599 - 0.50	18	20	20	22	26	29
		0.499 - 0.38	20	23	24	25	31	34
		0.379 - 0.25	25	30	31	30	39	44
		0.249 - 0.00	33	43	46	37	53	62
	0.250 - 0.499	1.000 - 0.71	18	18	18	21	24	26
		0.709 - 0.60	19	22	22	24	29	32
		0.599 - 0.50	22	26	26	27	34	38
		0.499 - 0.38	25	30	31	30	40	44
		0.379 - 0.00	30	39	40	35	49	56
	0.500 +	1.000 - 0.71	20	23	24	25	31	34
		0.709 - 0.60	24	28	29	29	37	41
		0.599 - 0.50	27	33	34	32	42	48
		0.499 - 0.00	30	38	40	36	49	55

OPAQUE WALL Uow

ILD 0 - 1.50:

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.11	HC ≥ 5	15	0.12	0.17
	HC ≥ 10	15	0.14	0.21
	HC ≥ 15	15	0.17	0.23
	HC ≥ 5	58	0.11	0.16
	HC ≥ 10	58	0.14	0.20
	HC ≥ 15	58	0.16	0.21

ILD 1.51 - 3.00:

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.11	HC ≥ 5	13	0.12	0.19
	HC ≥ 10	13	0.16	0.25
	HC ≥ 15	13	0.20	0.27
	HC ≥ 5	62	0.12	0.17
	HC ≥ 10	62	0.15	0.22
	HC ≥ 15	62	0.18	0.23

3.01 - 3.50

0.000 - 0.249	1.000 - 0.71	11	11	11	15	17	19
	0.709 - 0.60	13	14	14	18	21	24
	0.599 - 0.50	15	17	17	21	25	28
	0.499 - 0.38	18	20	20	24	29	33
	0.379 - 0.25	22	26	27	28	37	42
	0.249 - 0.00	29	37	39	35	50	59
0.250 - 0.499	1.000 - 0.71	14	15	15	20	23	25
	0.709 - 0.60	17	19	19	23	28	31
	0.599 - 0.50	19	22	22	25	32	36
	0.499 - 0.38	22	26	27	28	37	43
	0.379 - 0.00	27	33	35	33	48	54
0.500 +	1.000 - 0.71	17	19	20	24	29	33
	0.709 - 0.60	21	24	25	27	35	40
	0.599 - 0.50	23	28	29	30	40	46
	0.499 - 0.00	26	33	34	33	45	53

Daylight Sensing Controls

Uow (HC<5)	HC RANGE	PCT FEN	INT INS	EXT INS
0.11	HC ≥ 5	11	0.12	0.19
	HC ≥ 10	11	0.16	0.26
	HC ≥ 15	11	0.21	0.28
	HC ≥ 5	59	0.12	0.17
	HC ≥ 10	59	0.15	0.22
	HC ≥ 15	59	0.18	0.24

	Min R-Value		
WALL BELOW GRADE:	8		
UNHEATED SLAB ON GRADE:	24"	36"	48"
Horizontal	15	12	10
Vertical	7	5	4

	Max Uo
ROOF:	0.055
WALL ADJACENT TO UNCOND SPACE:	0.16
FLOOR OVER UNCOND SPACE:	0.065

ALTERNATE COMPONENT PACKAGES FOR:

HDD50 = 1001 - 1750
CDD65 = 1151 - 2000
VSEW = 600 - 845

Charlotte NC
Chattanooga TN
Greensboro NC
Knoxville TN
Nashville TN

Norfolk VA
Patuxent MD
Raleigh NC
Richmond VA
Roanoke VA

TABLE 5.4-17

INTERNAL LOAD DENSITY (ILD) RANGE	PROJECTION FACTOR (PF)	SHADING COEFF RANGE (SCx)	Uof BASE CASE 0.81 to 0.46	Uof BASE CASE 0.45 to 0.39	Uof BASE CASE 0.38 to 0	Uof PERIMETER DAYLIGHTING 0.81 to 0.46	Uof PERIMETER DAYLIGHTING 0.45 to 0	Uof PERIMETER DAYLIGHTING 0.38 to 0 (VLT ≥ SC)
0 - 1.50	0.000 - 0.249	1.000 - 0.71	16	18	18	18	20	20
		0.709 - 0.60	20	22	22	21	24	25
		0.599 - 0.50	23	26	26	24	28	30
		0.499 - 0.38	26	30	31	28	33	35
		0.379 - 0.25	32	39	40	34	43	46
		0.249 - 0.00	41	56	59	43	60	66
	0.250 - 0.499	1.000 - 0.71	21	23	24	23	26	27
		0.709 - 0.60	25	28	29	27	31	33
		0.599 - 0.50	28	33	34	30	37	39
		0.499 - 0.38	32	39	41	34	43	46
		0.379 - 0.00	38	50	52	40	54	58
	0.500 +	1.000 - 0.71	26	30	30	28	33	34
		0.709 - 0.60	30	36	37	32	40	42
		0.599 - 0.50	34	42	44	36	46	49
		0.499 - 0.00	38	49	51	40	53	58
1.51 - 3.00	0.000 - 0.249	1.000 - 0.71	13	14	14	18	20	21
		0.709 - 0.60	16	17	17	22	24	27
		0.599 - 0.50	19	21	21	26	29	31
		0.499 - 0.38	22	25	26	29	34	37
		0.379 - 0.25	28	32	33	35	44	49
		0.249 - 0.00	37	47	49	45	62	70
	0.250 - 0.499	1.000 - 0.71	17	18	19	23	26	28
		0.709 - 0.60	21	23	23	27	32	35
		0.599 - 0.50	24	27	27	31	37	41
		0.499 - 0.38	28	32	33	35	44	49
		0.379 - 0.00	34	41	43	41	55	63
	0.500 +	1.000 - 0.71	21	24	24	28	33	36
		0.709 - 0.60	26	29	30	33	40	45
		0.599 - 0.50	29	34	36	37	47	52
		0.499 - 0.00	33	41	42	41	55	61

OPAQUE WALL Uow — ILD 0 - 1.50

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.12	HC ≥ 5	16	0.14	0.18
	HC ≥ 10	16	0.17	0.22
	HC ≥ 15	16	0.19	0.24
	HC ≥ 5	66	0.14	0.18
	HC ≥ 10	66	0.16	0.21
	HC ≥ 15	66	0.19	0.23

OPAQUE WALL Uow — ILD 1.51 - 3.00

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.12	HC ≥ 5	13	0.14	0.20
	HC ≥ 10	13	0.16	0.26
	HC ≥ 15	13	0.23	0.29
	HC ≥ 5	70	0.14	0.18
	HC ≥ 10	70	0.17	0.23
	HC ≥ 15	70	0.20	0.25

3.01 - 3.50

0.000 - 0.249	1.000 - 0.71	11	12	12	17	18	20
	0.709 - 0.60	14	14	15	20	23	25
	0.599 - 0.50	16	17	17	23	27	30
	0.499 - 0.38	19	21	21	27	32	36
	0.379 - 0.25	24	27	28	33	41	47
	0.249 - 0.00	32	40	42	42	58	68
0.250 - 0.499	1.000 - 0.71	14	15	15	22	24	27
	0.709 - 0.60	18	19	19	25	30	34
	0.599 - 0.50	20	23	23	29	35	39
	0.499 - 0.38	24	27	28	33	41	47
	0.379 - 0.00	29	35	36	39	52	60
0.500 +	1.000 - 0.71	18	20	20	26	31	35
	0.709 - 0.60	22	24	25	31	38	43
	0.599 - 0.50	25	29	29	34	44	50
	0.499 - 0.00	29	34	35	38	51	59

Daylight Sensing Controls

Uow (HC<5)	HC RANGE	PCT FEN	INT INS	EXT INS
0.12	HC ≥ 5	11	0.14	0.20
	HC ≥ 10	11	0.19	0.27
	HC ≥ 15	11	0.24	0.30
	HC ≥ 5	60	0.14	0.19
	HC ≥ 10	60	0.17	0.23
	HC ≥ 15	60	0.20	0.25

	Min R-Value		
WALL BELOW GRADE:	8		
UNHEATED SLAB ON GRADE:	24"	36"	48"
Horizontal	13	11	9
Vertical	6	5	4

	Max Uo
ROOF:	0.066
WALL ADJACENT TO UNCOND SPACE:	0.17
FLOOR OVER UNCOND SPACE:	0.074

ALTERNATE COMPONENT PACKAGES FOR:

HDD50 = 1001 - 1750
CDD65 = 1161 - 2000
VSEW = > 845

Albuquerque NM
Amarillo TX
Lubbock TX
Oklahoma City OK
Roswell NM
Truth or Consequences NM
Tucumcari NM

TABLE 5.4-18

INTERNAL LOAD DENSITY (ILD) RANGE	PROJECTION FACTOR (PF)	SHADING COEFF RANGE (SCx)	Uof BASE CASE 0.81 to 0.46	Uof BASE CASE 0.45 to 0.39	Uof BASE CASE 0.38 to 0	Uof PERIMETER DAYLIGHTING 0.81 to 0.46	Uof PERIMETER DAYLIGHTING 0.45 to 0	Uof PERIMETER DAYLIGHTING 0.38 to 0 (VLT ≥ SC)
0 - 1.50	0.000 - 0.249	1.000 - 0.71	14	15	16	15	17	17
		0.709 - 0.60	17	19	19	18	21	22
		0.599 - 0.50	19	22	23	20	24	25
		0.499 - 0.38	22	26	27	23	28	30
		0.379 - 0.25	27	33	35	28	36	38
		0.249 - 0.00	33	47	50	35	49	54
	0.250 - 0.499	1.000 - 0.71	18	20	21	19	22	23
		0.709 - 0.60	21	25	26	22	27	28
		0.599 - 0.50	24	29	30	25	31	33
		0.499 - 0.38	27	34	35	28	36	39
		0.379 - 0.00	31	42	45	32	45	49
	0.500 +	1.000 - 0.71	22	26	27	23	28	30
		0.709 - 0.60	25	31	33	27	34	36
		0.599 - 0.50	28	36	38	29	39	42
		0.499 - 0.00	31	42	45	32	45	49
1.51 - 3.00	0.000 - 0.249	1.000 - 0.71	11	12	12	15	16	18
		0.709 - 0.60	14	15	15	18	20	22
		0.599 - 0.50	16	18	18	20	23	26
		0.499 - 0.38	19	21	22	23	28	31
		0.379 - 0.25	23	27	28	28	35	40
		0.249 - 0.00	31	39	42	35	49	57
	0.250 - 0.499	1.000 - 0.71	15	16	16	19	22	24
		0.709 - 0.60	18	20	20	22	26	29
		0.599 - 0.50	20	23	24	25	30	34
		0.499 - 0.38	23	27	28	28	36	40
		0.379 - 0.00	28	35	37	33	46	51
	0.500 +	1.000 - 0.71	18	21	21	23	28	31
		0.709 - 0.60	22	25	26	27	33	37
		0.599 - 0.50	24	29	30	29	38	43
		0.499 - 0.00	28	35	36	33	44	51

OPAQUE WALL Uow

ILD 0 - 1.50:

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.11	HC ≥ 5	14	0.12	0.16
	HC ≥ 10	14	0.14	0.21
	HC ≥ 15	14	0.17	0.22
	HC ≥ 5	54	0.11	0.16
	HC ≥ 10	54	0.14	0.19
	HC ≥ 15	54	0.16	0.21

ILD 1.51 - 3.00:

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.11	HC ≥ 5	11	0.12	0.18
	HC ≥ 10	11	0.16	0.23
	HC ≥ 15	11	0.19	0.26
	HC ≥ 5	57	0.12	0.17
	HC ≥ 10	57	0.15	0.21
	HC ≥ 15	57	0.17	0.23

3.01 - 3.50

0.000 - 0.249	1.000 - 0.71	10	10	10	14	15	17
	0.709 - 0.60	12	13	13	16	18	21
	0.599 - 0.50	14	15	15	19	22	25
	0.499 - 0.38	16	18	18	21	26	29
	0.379 - 0.25	20	23	24	26	33	38
	0.249 - 0.00	27	34	35	33	46	54
0.250 - 0.499	1.000 - 0.71	12	13	14	17	20	22
	0.709 - 0.60	15	17	17	20	24	28
	0.599 - 0.50	17	20	20	23	28	33
	0.499 - 0.38	20	23	24	26	33	38
	0.379 - 0.00	24	30	31	30	41	49
0.500 +	1.000 - 0.71	16	17	18	21	25	29
	0.709 - 0.60	19	21	22	25	31	36
	0.699 - 0.50	21	25	26	27	35	41
	0.499 - 0.00	24	29	31	30	41	48

Uow (HC<5)	HC RANGE	PCT FEN	INT INS	EXT INS
0.11	HC ≥ 5	10	0.12	0.18
	HC ≥ 10	10	0.16	0.24
	HC ≥ 15	10	0.20	0.26
	HC ≥ 5	54	0.12	0.17
	HC ≥ 10	54	0.15	0.22
	HC ≥ 15	54	0.18	0.23

Daylight Sensing Controls

	Min R-Value		
WALL BELOW GRADE	8		
UNHEATED SLAB ON GRADE:	24"	36"	48"
Horizontal	14	11	9
Vertical	7	5	4

	Max Uo
ROOF:	0.059
WALL ADJACENT TO UNCOND SPACE	0.17
FLOOR OVER UNCOND SPACE:	0.070

ALTERNATE COMPONENT PACKAGES FOR:

HDD50 = 1001 - 1750
CDD65 = 2001 - 3250
VSEW = 580 - 845

Fort Smith AR
Memphis TN
Tulsa OK

TABLE 5.4-19

INTERNAL LOAD DENSITY (ILD) RANGE	PROJECTION FACTOR (PF)	SHADING COEFF RANGE (SCx)	Uof: BASE CASE 0.81 to 0.46	BASE CASE 0.45 to 0.39	BASE CASE 0.38 to 0	PERIMETER DAYLIGHTING 0.81 to 0.46	PERIMETER DAYLIGHTING 0.45 to 0	PERIMETER DAYLIGHTING 0.38 to 0 (VLT ≥ SC)
0 - 1.50	0.000 - 0.249	1.000 - 0.71	14	15	15	16	17	17
		0.709 - 0.60	17	19	19	19	21	22
		0.599 - 0.50	20	22	22	22	25	26
		0.499 - 0.38	24	26	27	26	29	31
		0.379 - 0.25	30	35	36	32	38	41
		0.249 - 0.00	41	52	54	43	57	62
	0.250 - 0.499	1.000 - 0.71	18	20	20	20	22	23
		0.709 - 0.60	22	25	25	24	27	29
		0.599 - 0.50	26	29	30	28	32	34
		0.499 - 0.38	30	35	36	32	39	41
		0.379 - 0.00	37	45	47	40	50	53
	0.500 +	1.000 - 0.71	23	26	26	25	29	30
		0.709 - 0.60	28	32	32	30	35	37
		0.599 - 0.50	32	37	38	34	41	44
		0.499 - 0.00	36	44	46	39	49	52
1.51 - 3.00	0.000 - 0.249	1.000 - 0.71	11	11	11	15	16	18
		0.709 - 0.60	13	14	14	19	20	22
		0.599 - 0.50	16	17	17	22	24	27
		0.499 - 0.38	19	20	20	25	29	32
		0.379 - 0.25	24	27	27	32	38	43
		0.249 - 0.00	34	41	42	43	56	65
	0.250 - 0.499	1.000 - 0.71	14	15	15	20	21	24
		0.709 - 0.60	17	19	19	24	27	30
		0.599 - 0.50	20	22	22	28	32	35
		0.499 - 0.38	24	27	27	32	38	43
		0.379 - 0.00	30	35	36	39	49	56
	0.500 +	1.000 - 0.71	18	19	19	25	28	31
		0.709 - 0.60	22	24	24	30	34	39
		0.599 - 0.50	26	29	29	34	40	46
		0.499 - 0.00	30	34	35	39	48	55

OPAQUE WALL Uow

ILD	LIGHT WEIGHT WALL: Uow (HC<5)	MASS WALL: HC RANGE	PCT FEN	INT INS	EXT INS
0 - 1.50	0.13	HC ≥ 5	14	0.14	0.20
		HC ≥ 10	14	0.18	0.25
		HC ≥ 15	14	0.22	0.27
		HC ≥ 5	62	0.14	0.20
		HC ≥ 10	62	0.18	0.24
		HC ≥ 15	62	0.21	0.26
1.51 - 3.00	0.13	HC ≥ 5	11	0.15	0.21
		HC ≥ 10	11	0.19	0.27
		HC ≥ 15	11	0.24	0.30
		HC ≥ 5	65	0.14	0.20
		HC ≥ 10	65	0.18	0.26
		HC ≥ 15	65	0.23	0.28

3.01 - 3.50

0.000 - 0.249	1.000 - 0.71	9	9	9	14	14	17
	0.709 - 0.60	11	11	11	17	18	21
	0.599 - 0.50	13	14	14	20	21	25
	0.499 - 0.38	15	16	17	23	26	30
	0.379 - 0.25	20	22	22	29	34	40
	0.249 - 0.00	28	33	34	39	51	61
0.250 - 0.499	1.000 - 0.71	12	12	12	18	19	22
	0.709 - 0.60	14	15	15	22	24	28
	0.599 - 0.50	17	18	18	25	28	33
	0.499 - 0.38	20	22	22	29	34	40
	0.379 - 0.00	25	29	29	35	44	53
0.500 +	1.000 - 0.71	15	16	16	22	25	29
	0.709 - 0.60	18	19	20	27	31	36
	0.599 - 0.50	21	23	23	30	36	43
	0.499 - 0.00	24	28	28	35	43	52

Daylight Sensing Controls

Uow (HC<5)	HC RANGE	PCT FEN	INT INS	EXT INS
0.13	HC ≥ 5	9	0.15	0.22
	HC ≥ 10	9	0.19	0.28
	HC ≥ 15	9	0.24	0.31
	HC ≥ 5	61	0.15	0.21
	HC ≥ 10	61	0.18	0.26
	HC ≥ 15	61	0.23	0.29

	Min R-Value		
WALL BELOW GRADE:	7		
UNHEATED SLAB ON GRADE:	24"	36"	48"
Horizontal	12	10	8
Vertical	6	5	4

	Max Uo
ROOF:	0.058
WALL ADJACENT TO UNCOND SPACE:	0.19
FLOOR OVER UNCOND SPACE:	0.083

ALTERNATE COMPONENT PACKAGES FOR:

HDD50 = 1751 - 2600
CDD65 = 0 - 1150
VSEW = 500 - 845

Baltimore MD, Boston MA, Charleston WV, Columbus OH, Covington KY, Dayton OH, Harrisburg PA, Lewiston ID, Newark NJ, New York NY, New York (LAG) NY, Philadelphia PA, Redmond OR, Washington DC, Yakima WA

TABLE 5.4-20

Uof

INTERNAL LOAD DENSITY (ILD) RANGE	PROJECTION FACTOR (PF)	SHADING COEFF RANGE (SCx)	BASE CASE 0.68 to 0.46	BASE CASE 0.45 to 0.39	BASE CASE 0.38 to 0	PERIMETER DAYLIGHTING 0.68 to 0.46	PERIMETER DAYLIGHTING 0.45 to 0	PERIMETER DAYLIGHTING 0.38 to 0 (VLT ≥ SC)
0 - 1.50	0.000 - 0.249	1.000 - 0.71	22	26	27	23	27	29
		0.709 - 0.60	25	30	32	26	32	34
		0.599 - 0.50	27	34	37	28	36	39
		0.499 - 0.38	30	39	42	30	40	44
		0.379 - 0.25	33	45	51	33	46	52
		0.249 - 0.00	36	54	63	36	54	63
	0.250 - 0.499	1.000 - 0.71	26	33	35	27	34	37
		0.709 - 0.60	29	38	41	30	39	43
		0.599 - 0.50	31	42	46	31	43	48
		0.499 - 0.38	33	46	52	33	47	53
		0.379 - 0.00	36	52	60	35	52	61
	0.500 +	1.000 - 0.71	30	39	43	30	41	45
		0.709 - 0.60	33	45	49	33	46	52
		0.599 - 0.50	34	49	55	34	49	56
		0.499 - 0.00	36	52	60	35	53	61
1.51 - 3.00	0.000 - 0.249	1.000 - 0.71	20	22	22	24	28	29
		0.709 - 0.60	23	26	27	27	33	35
		0.599 - 0.50	25	30	32	29	37	40
		0.499 - 0.38	28	35	37	32	41	46
		0.379 - 0.25	32	42	46	35	48	55
		0.249 - 0.00	38	53	60	39	58	68
	0.250 - 0.499	1.000 - 0.71	24	28	29	28	35	37
		0.709 - 0.60	27	33	35	31	40	44
		0.599 - 0.50	30	38	40	33	44	50
		0.499 - 0.38	33	42	46	35	49	58
		0.379 - 0.00	36	50	55	38	55	65
	0.500 +	1.000 - 0.71	28	35	37	32	42	47
		0.709 - 0.60	32	40	43	34	47	54
		0.599 - 0.50	34	45	49	36	51	59
		0.499 - 0.00	36	50	55	38	55	65

OPAQUE WALL Uow

ILD 0 - 1.50:

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.088	HC ≥ 5	22	0.096	0.12
	HC ≥ 10	22	0.11	0.15
	HC ≥ 15	22	0.12	0.16
	HC ≥ 5	63	0.093	0.11
	HC ≥ 10	63	0.10	0.13
	HC ≥ 15	63	0.11	0.14

ILD 1.51 - 3.00:

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.088	HC ≥ 5	20	0.097	0.14
	HC ≥ 10	20	0.11	0.17
	HC ≥ 15	20	0.13	0.18
	HC ≥ 5	68	0.096	0.12
	HC ≥ 10	68	0.10	0.14
	HC ≥ 15	68	0.11	0.15

3.01 - 3.50	0.000 - 0.249	1.000 - 0.71	18	19	20	23	27	28
		0.709 - 0.60	21	23	24	26	32	34
		0.599 - 0.50	23	27	28	29	36	39
		0.499 - 0.38	26	31	33	31	41	45
		0.379 - 0.25	30	38	41	34	47	54
		0.249 - 0.00	36	49	55	39	57	67
	0.250 - 0.499	1.000 - 0.71	22	25	26	27	34	37
		0.709 - 0.60	25	30	31	30	39	44
		0.599 - 0.50	28	34	36	33	43	49
		0.499 - 0.38	30	39	42	35	48	55
		0.379 - 0.00	34	46	51	38	54	64
	0.500 +	1.000 - 0.71	26	31	33	31	41	46
		0.709 - 0.60	29	36	39	34	46	53
		0.599 - 0.50	32	41	44	36	50	59
		0.499 - 0.00	34	46	50	38	54	64

Daylight Sensing Controls

Uow (HC<5)	HC RANGE	PCT FEN	INT INS	EXT INS
0.088	HC ≥ 5	18	0.098	0.14
	HC ≥ 10	18	0.11	0.18
	HC ≥ 15	18	0.13	0.19
	HC ≥ 5	67	0.095	0.12
	HC ≥ 10	67	0.10	0.14
	HC ≥ 15	67	0.11	0.16

	Min R-Value		
WALL BELOW GRADE:	9		
UNHEATED SLAB ON GRADE:	24"	36"	48"
Horizontal	17	14	11
Vertical	8	6	4

	Max Uo
ROOF:	0.056
WALL ADJACENT TO UNCOND SPACE:	0.13
FLOOR OVER UNCOND SPACE:	0.048

ALTERNATE COMPONENT PACKAGES FOR:

HDD50 = 2001 - 3200
CDD65 = 0 - 1150
VSEW = 560 - 845

Akron OH, Allentown PA, Burlington IA, Chicago IL, Detroit MI, Erie PA, Hartford CT, Indianapolis IN, Omaha NE, Pittsburgh PA, Providence RI, South Bend IN, Spokane WA, Toledo OH, Youngstown OH

TABLE 5.4-21

INTERNAL LOAD DENSITY (ILD) RANGE	PROJECTION FACTOR (PF)	SHADING COEFF RANGE (SCx)	Uof BASE CASE 0.68 to 0.46	BASE CASE 0.45 to 0.39	BASE CASE 0.38 to 0	PERIMETER DAYLIGHTING 0.68 to 0.46	PERIMETER DAYLIGHTING 0.45 to 0	PERIMETER DAYLIGHTING 0.38 to 0 (VLT ≥ SC)
0 - 1.50	0.000 - 0.249	1.000 - 0.71	21	26	28	21	27	29
		0.709 - 0.60	24	30	33	23	31	34
		0.599 - 0.50	25	34	37	25	34	38
		0.499 - 0.38	26	37	41	26	37	42
		0.379 - 0.25	28	41	47	27	40	47
		0.249 - 0.00	29	46	54	28	44	53
	0.250 - 0.499	1.000 - 0.71	25	32	35	24	33	37
		0.709 - 0.60	26	36	41	26	37	41
		0.599 - 0.50	27	39	44	27	39	45
		0.499 - 0.38	28	42	48	27	41	48
		0.379 - 0.00	29	46	53	28	44	52
	0.500 +	1.000 - 0.71	27	38	42	26	38	43
		0.709 - 0.60	28	41	47	27	41	48
		0.599 - 0.50	29	44	51	28	43	50
		0.499 - 0.00	30	46	54	29	44	53
1.51 - 3.00	0.000 - 0.249	1.000 - 0.71	19	23	23	22	27	29
		0.709 - 0.60	22	27	28	24	32	34
		0.599 - 0.50	24	30	32	26	35	39
		0.499 - 0.38	26	34	37	28	38	43
		0.379 - 0.25	29	40	44	30	43	49
		0.249 - 0.00	32	47	54	32	49	57
	0.250 - 0.499	1.000 - 0.71	23	28	30	25	33	37
		0.709 - 0.60	26	33	36	27	38	43
		0.599 - 0.50	28	36	40	29	40	47
		0.499 - 0.38	29	40	45	30	43	50
		0.379 - 0.00	31	45	52	32	47	55
	0.500 +	1.000 - 0.71	26	34	37	28	39	45
		0.709 - 0.60	29	39	43	29	42	50
		0.599 - 0.50	30	42	47	30	45	53
		0.499 - 0.00	32	45	52	32	47	58

OPAQUE WALL Uow

ILD 0 - 1.50:

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.080	HC ≥ 5	21	0.084	0.10
	HC ≥ 10	21	0.092	0.12
	HC ≥ 15	21	0.099	0.12
	HC ≥ 5	54	0.083	0.10
	HC ≥ 10	54	0.090	0.11
	HC ≥ 15	54	0.096	0.12

ILD 1.51 - 3.00:

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.080	HC ≥ 5	19	0.085	0.11
	HC ≥ 10	19	0.095	0.13
	HC ≥ 15	19	0.10	0.14
	HC ≥ 5	57	0.083	0.10
	HC ≥ 10	57	0.089	0.11
	HC ≥ 15	57	0.096	0.12

3.01 - 3.50

0.000 - 0.249	1.000 - 0.71	18	20	21	22	27	29
	0.709 - 0.60	20	24	25	24	31	34
	0.599 - 0.50	23	28	29	26	34	38
	0.499 - 0.38	25	31	34	27	38	43
	0.379 - 0.25	28	37	41	30	43	49
	0.249 - 0.00	31	45	51	32	48	57
0.250 - 0.499	1.000 - 0.71	21	26	27	25	33	36
	0.709 - 0.60	24	30	32	27	37	42
	0.599 - 0.50	26	34	37	28	40	46
	0.499 - 0.38	28	37	41	30	43	50
	0.379 - 0.00	30	43	48	32	47	55
0.500 +	1.000 - 0.71	25	31	34	28	38	44
	0.709 - 0.60	27	36	39	29	42	49
	0.599 - 0.50	29	39	44	30	44	53
	0.499 - 0.00	30	43	48	31	47	56

Daylight Sensing Controls

Uow (HC<5)	HC RANGE	PCT FEN	INT INS	EXT INS
0.080	HC ≥ 5	18	0.086	0.11
	HC ≥ 10	18	0.097	0.14
	HC ≥ 15	18	0.10	0.15
	HC ≥ 5	57	0.083	0.10
	HC ≥ 10	57	0.090	0.12
	HC ≥ 15	57	0.096	0.12

	Min R-Value		
WALL BELOW GRADE:	10		
UNHEATED SLAB ON GRADE:	24"	36"	48"
Horizontal	17	14	11
Vertical	8	6	4

	Max Uo
ROOF:	0.054
WALL ADJACENT TO UNCOND SPACE:	0.13
FLOOR OVER UNCOND SPACE:	0.047

ALTERNATE COMPONENT PACKAGES FOR:

HDD50 = 1751 - 3200
CDD65 = 0 - 1150
VSEW = > 846

Boise ID
Cedar UT
Clayton NM
Colorado Springs CO
Denver CO
Goodland KS
Lovelock NV
Mount Shasta CA
Pueblo CO
Reno NV
Salt Lake City UT
Tonopah NV
Winnemucca NV

TABLE 5.4-22

INTERNAL LOAD DENSITY (ILD) RANGE	PROJECTION FACTOR (PF)	SHADING COEFF RANGE (SCx)	BASE CASE Uof 0.68 to 0.46	BASE CASE Uof 0.45 to 0.39	BASE CASE Uof 0.38 to 0	PERIMETER DAYLIGHTING Uof 0.68 to 0.46	PERIMETER DAYLIGHTING Uof 0.45 to 0	PERIMETER DAYLIGHTING Uof 0.38 to 0 (VLT ≥ SC)
0 - 1.50	0.000 - 0.249	1.000 - 0.71	22	24	25	23	26	27
		0.709 - 0.60	25	29	31	26	31	33
		0.599 - 0.50	27	33	35	28	35	38
		0.499 - 0.38	30	38	41	30	39	43
		0.379 - 0.25	33	45	49	33	46	52
		0.249 - 0.00	37	54	62	37	55	63
	0.250 - 0.499	1.000 - 0.71	28	31	33	27	33	36
		0.709 - 0.60	29	37	39	30	39	42
		0.599 - 0.50	32	41	45	32	43	47
		0.499 - 0.38	34	46	50	34	47	53
		0.379 - 0.00	37	52	59	36	53	61
	0.500 +	1.000 - 0.71	31	39	41	31	40	44
		0.709 - 0.60	33	44	48	33	46	51
		0.599 - 0.50	35	48	54	35	49	56
		0.499 - 0.00	37	53	60	37	53	62
1.51 - 3.00	0.000 - 0.249	1.000 - 0.71	19	20	21	23	26	28
		0.709 - 0.60	22	25	25	26	31	33
		0.599 - 0.50	25	29	30	29	36	39
		0.499 - 0.38	28	33	35	32	41	45
		0.379 - 0.25	32	41	44	36	48	54
		0.249 - 0.00	39	52	58	40	58	68
	0.250 - 0.499	1.000 - 0.71	23	26	27	28	34	36
		0.709 - 0.60	27	32	33	31	39	43
		0.599 - 0.50	30	36	38	34	44	49
		0.499 - 0.38	33	41	44	36	48	55
		0.379 - 0.00	37	49	54	39	55	64
	0.500 +	1.000 - 0.71	28	33	35	32	41	45
		0.709 - 0.60	32	39	41	35	47	53
		0.599 - 0.50	34	44	47	37	51	59
		0.499 - 0.00	37	49	54	39	56	65

OPAQUE WALL Uow

ILD 0 - 1.50:

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.092	HC ≥ 5	22	0.10	0.13
	HC ≥ 10	22	0.11	0.15
	HC ≥ 15	22	0.12	0.16
	HC ≥ 5	63	0.098	0.12
	HC ≥ 10	63	0.10	0.13
	HC ≥ 15	63	0.11	0.14

ILD 1.51 - 3.00:

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.092	HC ≥ 5	19	0.10	0.14
	HC ≥ 10	19	0.12	0.18
	HC ≥ 15	19	0.14	0.19
	HC ≥ 5	68	0.099	0.12
	HC ≥ 10	68	0.11	0.14
	HC ≥ 15	68	0.12	0.16

3.01 - 3.50

0.000 - 0.249	1.000 - 0.71	17	18	18	22	26	27
	0.709 - 0.60	20	22	23	26	31	33
	0.599 - 0.50	22	26	26	28	35	38
	0.499 - 0.38	25	30	31	31	39	44
	0.379 - 0.25	30	37	39	35	47	53
	0.249 - 0.00	36	48	53	40	57	67
0.250 - 0.499	1.000 - 0.71	21	23	24	27	33	35
	0.709 - 0.60	24	28	29	30	38	42
	0.599 - 0.50	27	32	34	33	43	48
	0.499 - 0.38	30	37	40	35	47	54
	0.379 - 0.00	35	45	49	38	54	63
0.500 +	1.000 - 0.71	25	30	31	31	40	44
	0.709 - 0.60	29	35	37	34	46	52
	0.599 - 0.50	32	39	42	36	50	58
	0.499 - 0.00	35	44	48	38	54	64

Uow (HC<5)	HC RANGE	PCT FEN	INT INS	EXT INS
0.092	HC ≥ 5	17	0.10	0.15
	HC ≥ 10	17	0.12	0.19
	HC ≥ 15	17	0.14	0.20
	HC ≥ 5	67	0.099	0.13
	HC ≥ 10	67	0.11	0.16
	HC ≥ 15	67	0.12	0.16

Daylight Sensing Controls

	Min R-Value		
WALL BELOW GRADE:	9		
UNHEATED SLAB ON GRADE:	24"	36"	48"
Horizontal	16	14	10
Vertical	7	6	4

	Max Uo
ROOF:	0.052
WALL ADJACENT TO UNCOND SPACE:	0.13
FLOOR OVER UNCOND SPACE:	0.049

ALTERNATE COMPONENT PACKAGES FOR:

HDD50 = 1751 - 3200
CDD65 = 1151 - 2000
VSEW = 560 - 845

Columbia MO
Evansville IN
Lexington KY
Louisville KY
Saint Louis MO

Springfield IL
Topeka KS

TABLE 5.4-23

Columbia MO, Evansville IN, Lexington KY, Louisville KY, Saint Louis MO

INTERNAL LOAD DENSITY (ILD) RANGE	PROJECTION FACTOR (PF)	SHADING COEFF RANGE (SCx)	BASE CASE Uof 0.81 to 0.46	BASE CASE Uof 0.45 to 0.39	BASE CASE Uof 0.38 to 0	PERIMETER DAYLIGHTING Uof 0.81 to 0.46	PERIMETER DAYLIGHTING Uof 0.45 to 0	PERIMETER DAYLIGHTING Uof 0.38 to 0 (VLT ≥ SC)
0 - 1.50	0.000 - 0.249	1.000 - 0.71	17	19	19	18	20	21
		0.709 - 0.60	20	23	23	21	25	26
		0.599 - 0.50	22	26	27	24	29	31
		0.499 - 0.38	25	31	32	27	34	36
		0.379 - 0.25	30	39	41	31	42	45
		0.249 - 0.00	37	54	58	38	57	63
	0.250 - 0.499	1.000 - 0.71	21	24	25	22	27	28
		0.709 - 0.60	24	29	30	26	32	34
		0.599 - 0.50	27	34	36	28	37	40
		0.499 - 0.38	30	40	42	31	43	46
		0.379 - 0.00	35	49	52	36	52	57
	0.500 +	1.000 - 0.71	25	31	32	27	33	36
		0.709 - 0.60	29	37	39	30	40	43
		0.599 - 0.50	31	42	45	33	45	49
		0.499 - 0.00	34	48	52	36	52	57

OPAQUE WALL Uow

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.11	HC ≥ 5	17	0.11	0.15
	HC ≥ 10	17	0.13	0.18
	HC ≥ 15	17	0.15	0.19
	HC ≥ 5	63	0.11	0.14
	HC ≥ 10	63	0.13	0.17
	HC ≥ 15	63	0.14	0.18

Springfield IL, Topeka KS

INTERNAL LOAD DENSITY (ILD) RANGE	PROJECTION FACTOR (PF)	SHADING COEFF RANGE (SCx)	BASE CASE Uof 0.81 to 0.46	BASE CASE Uof 0.45 to 0.39	BASE CASE Uof 0.38 to 0	PERIMETER DAYLIGHTING Uof 0.81 to 0.46	PERIMETER DAYLIGHTING Uof 0.45 to 0	PERIMETER DAYLIGHTING Uof 0.38 to 0 (VLT ≥ SC)
1.51 - 3.00	0.000 - 0.249	1.000 - 0.71	14	15	15	18	21	22
		0.709 - 0.60	17	19	19	22	25	27
		0.599 - 0.50	19	22	22	25	30	32
		0.499 - 0.38	22	26	27	28	35	38
		0.379 - 0.25	27	33	35	33	44	49
		0.249 - 0.00	35	47	50	40	59	68
	0.250 - 0.499	1.000 - 0.71	18	20	20	23	27	29
		0.709 - 0.60	21	24	25	27	33	36
		0.599 - 0.50	24	28	29	30	38	42
		0.499 - 0.38	27	33	35	33	44	49
		0.379 - 0.00	32	42	44	38	54	62
	0.500 +	1.000 - 0.71	22	25	26	27	34	37
		0.709 - 0.60	25	31	32	31	41	45
		0.599 - 0.50	28	36	37	34	47	52
		0.499 - 0.00	32	41	44	37	53	61

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.11	HC ≥ 5	14	0.11	0.18
	HC ≥ 10	14	0.14	0.20
	HC ≥ 15	14	0.17	0.22
	HC ≥ 5	68	0.11	0.15
	HC ≥ 10	68	0.13	0.18
	HC ≥ 15	68	0.15	0.19

3.01 - 3.50

0.000 - 0.249	1.000 - 0.71	12	13	13	17	19	21
	0.709 - 0.60	14	16	16	20	24	26
	0.599 - 0.50	17	19	19	23	28	31
	0.499 - 0.38	19	22	23	26	33	37
	0.379 - 0.25	24	29	30	31	41	47
	0.249 - 0.00	31	41	43	38	56	66
0.250 - 0.499	1.000 - 0.71	15	17	17	22	25	28
	0.709 - 0.60	18	21	21	25	31	35
	0.599 - 0.50	21	24	25	28	36	40
	0.499 - 0.38	24	29	30	31	41	47
	0.379 - 0.00	29	36	38	35	51	59
0.500 +	1.000 - 0.71	19	21	22	26	32	36
	0.709 - 0.60	22	26	27	29	38	44
	0.599 - 0.50	25	30	32	32	44	51
	0.499 - 0.00	28	36	37	35	50	59

Daylight Sensing Controls

Uow (HC<5)	HC RANGE	PCT FEN	INT INS	EXT INS
0.11	HC ≥ 5	12	0.11	0.16
	HC ≥ 10	12	0.14	0.21
	HC ≥ 15	12	0.17	0.23
	HC ≥ 5	66	0.11	0.15
	HC ≥ 10	66	0.13	0.18
	HC ≥ 15	66	0.15	0.19

	Min R-Value		
WALL BELOW GRADE:	9		
UNHEATED SLAB ON GRADE:	24"	36"	48"
Horizontal	15	13	10
Vertical	7	6	4

	Max Uo
ROOF:	0.056
WALL ADJACENT TO UNCOND SPACE	0.15
FLOOR OVER UNCOND SPACE:	0.058

ALTERNATE COMPONENT PACKAGES FOR: Dodge City KS, Grand Junction CO — TABLE 5.4-24

HDD50 = 1751 - 3200
CDD65 = 1151 - 2000
VSEW = > 845

INTERNAL LOAD DENSITY (ILD) RANGE	PROJECTION FACTOR (PF)	SHADING COEFF RANGE (SCx)	Uof: BASE CASE 0.81 to 0.46	BASE CASE 0.45 to 0.39	BASE CASE 0.38 to 0	PERIMETER DAYLIGHTING 0.81 to 0.46	PERIMETER DAYLIGHTING 0.45 to 0	PERIMETER DAYLIGHTING 0.38 to 0 (VLT ≥ SC)
0 - 1.50	0.000 - 0.249	1.000 - 0.71	15	17	17	18	19	19
		0.709 - 0.60	18	21	21	19	23	24
		0.599 - 0.50	20	24	25	21	26	28
		0.499 - 0.38	22	28	30	23	30	32
		0.379 - 0.25	26	35	38	27	37	41
		0.249 - 0.00	31	47	52	32	49	58
	0.250 - 0.499	1.000 - 0.71	19	22	23	20	24	25
		0.709 - 0.60	22	27	28	23	29	31
		0.599 - 0.50	24	31	33	25	33	36
		0.499 - 0.38	26	36	38	27	38	41
		0.379 - 0.00	30	44	47	31	46	51
	0.500 +	1.000 - 0.71	22	28	29	23	30	32
		0.709 - 0.60	25	34	35	26	36	39
		0.599 - 0.50	28	38	41	28	40	44
		0.499 - 0.00	30	43	47	31	46	51
1.51 - 3.00	0.000 - 0.249	1.000 - 0.71	12	13	14	16	18	20
		0.709 - 0.60	15	17	17	19	22	24
		0.599 - 0.50	17	20	20	21	26	28
		0.499 - 0.38	19	23	24	23	30	34
		0.379 - 0.25	23	29	31	27	37	42
		0.249 - 0.00	30	41	44	33	50	58
	0.250 - 0.499	1.000 - 0.71	16	18	18	20	24	26
		0.709 - 0.60	18	22	22	23	28	32
		0.599 - 0.50	21	25	26	25	33	37
		0.499 - 0.38	23	30	31	27	38	43
		0.379 - 0.00	28	37	39	31	46	53
	0.500 +	1.000 - 0.71	19	23	23	23	30	33
		0.709 - 0.60	22	27	29	26	35	40
		0.599 - 0.50	25	32	33	29	40	46
		0.499 - 0.00	27	37	39	31	45	53

OPAQUE WALL Uow (LIGHT WEIGHT WALL / MASS WALL)

ILD 0 - 1.50:

Uow (HC<5)	HC RANGE	PCT FEN	INT INS	EXT INS
0.097	HC ≥ 5	15	0.10	0.14
	HC ≥ 10	15	0.12	0.16
	HC ≥ 15	15	0.13	0.17
	HC ≥ 5	50	0.10	0.13
	HC ≥ 10	50	0.11	0.15
	HC ≥ 15	50	0.13	0.16

ILD 1.51 - 3.00:

Uow (HC<5)	HC RANGE	PCT FEN	INT INS	EXT INS
0.097	HC ≥ 5	12	0.10	0.14
	HC ≥ 10	12	0.12	0.16
	HC ≥ 15	12	0.14	0.19
	HC ≥ 5	50	0.10	0.14
	HC ≥ 10	50	0.12	0.16
	HC ≥ 15	50	0.13	0.17

3.01 - 3.50

0.000 - 0.249	1.000 - 0.71	11	11	12	15	17	19
	0.709 - 0.60	13	14	14	17	21	23
	0.599 - 0.50	15	17	17	20	24	27
	0.499 - 0.38	17	20	20	22	28	32
	0.379 - 0.25	21	25	27	26	35	41
	0.249 - 0.00	27	30	30	31	47	56
0.250 - 0.499	1.000 - 0.71	14	15	15	18	22	25
	0.709 - 0.60	16	19	19	21	27	30
	0.599 - 0.50	18	22	22	23	31	35
	0.499 - 0.38	21	26	27	26	35	41
	0.379 - 0.00	25	32	34	29	43	51
0.500 +	1.000 - 0.71	17	19	20	22	28	32
	0.709 - 0.60	19	24	24	25	33	38
	0.599 - 0.50	22	27	28	27	38	44
	0.499 - 0.00	24	32	33	29	43	50

Daylight Sensing Controls

Uow (HC<5)	HC RANGE	PCT FEN	INT INS	EXT INS
0.097	HC ≥ 5	11	0.10	0.15
	HC ≥ 10	11	0.12	0.18
	HC ≥ 15	11	0.15	0.20
	HC ≥ 5	56	0.10	0.14
	HC ≥ 10	56	0.12	0.17
	HC ≥ 15	56	0.14	0.18

	Min R-Value		
WALL BELOW GRADE:	9		
UNHEATED SLAB ON GRADE:	24"	36"	48"
Horizontal	16	13	10
Vertical	7	6	4

	Max Uo
ROOF:	0.053
WALL ADJACENT TO UNCOND SPACE:	0.14
FLOOR OVER UNCOND SPACE:	0.055

ALTERNATE COMPONENT PACKAGES FOR:

HDD50 = 3201 - 4000
CDD65 = 0 - 1150
VSEW = 560 - 845

Albany NY, Buffalo NY, Concord NH, Des Moines IA, Grand Island NE, Grand Rapids MI, Great Falls MT, Milwaukee WI, Missoula MT, Portland ME, Rapid City SD, Rochester NY, Sheridan WY, Sioux City IA, Syracuse NY

TABLE 5.4-25

INTERNAL LOAD DENSITY (ILD) RANGE	PROJECTION FACTOR (PF)	SHADING COEFF RANGE (SCx)	Uof BASE CASE 0.60 to 0.46	Uof BASE CASE 0.45 to 0.29	Uof BASE CASE 0.28 to 0	PERIMETER DAYLIGHTING N/A	PERIMETER DAYLIGHTING VLT ≥ SC
0 - 1.50	0.000 - 0.249	1.000 - 0.71	20	27	32		
		0.709 - 0.60	21	30	38		
		0.599 - 0.50	21	31	44		
		0.499 - 0.38	21	33	49		
		0.379 - 0.25	22	35	57		
		0.249 - 0.00	22	36	64		
	0.250 - 0.499	1.000 - 0.71	21	31	41		
		0.709 - 0.60	22	34	48		
		0.599 - 0.50	22	35	54		
		0.499 - 0.38	22	36	58		
		0.379 - 0.00	22	36	64		
	0.500 +	1.000 - 0.71	22	35	51		
		0.709 - 0.60	23	36	57		
		0.599 - 0.50	22	37	62		
		0.499 - 0.00	22	37	65		
1.51 - 3.00	0.000 - 0.249	1.000 - 0.71	19	24	27		
		0.709 - 0.60	21	27	33		
		0.599 - 0.50	22	30	38		
		0.499 - 0.38	23	32	43		
		0.379 - 0.25	24	36	52		
		0.249 - 0.00	26	40	64		
	0.250 - 0.499	1.000 - 0.71	22	29	35		
		0.709 - 0.60	23	32	42		
		0.599 - 0.50	24	34	47		
		0.499 - 0.38	25	37	53		
		0.379 - 0.00	26	39	61		
	0.500 +	1.000 - 0.71	23	33	44		
		0.709 - 0.60	25	36	51		
		0.599 - 0.50	25	38	56		
		0.499 - 0.00	26	40	62		

OPAQUE WALL Uow

ILD 0 - 1.50:

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.074	HC ≥ 5	20	0.076	0.096
	HC ≥ 10	20	0.082	0.10
	HC ≥ 15	20	0.087	0.11
	HC ≥ 5	65	0.077	0.098
	HC ≥ 10	65	0.084	0.11
	HC ≥ 15	65	0.089	0.11

ILD 1.51 - 3.00:

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.074	HC ≥ 5	19	0.077	0.10
	HC ≥ 10	19	0.084	0.12
	HC ≥ 15	19	0.091	0.12
	HC ≥ 5	64	0.077	0.10
	HC ≥ 10	64	0.084	0.11
	HC ≥ 15	64	0.091	0.12

3.01 - 3.50

0.000 - 0.249	1.000 - 0.71	18	22	24
	0.709 - 0.60	20	25	30
	0.599 - 0.50	21	28	34
	0.499 - 0.38	22	31	40
	0.379 - 0.25	24	35	49
	0.249 - 0.00	26	39	61
0.250 - 0.499	1.000 - 0.71	21	27	32
	0.709 - 0.60	22	30	38
	0.599 - 0.50	23	33	43
	0.499 - 0.38	24	35	49
	0.379 - 0.00	26	38	58
0.500 +	1.000 - 0.71	23	31	40
	0.709 - 0.60	24	34	47
	0.599 - 0.50	25	36	52
	0.499 - 0.00	26	39	58

Daylight Sensing Controls

o

Uow (HC<5)	HC RANGE	PCT FEN	INT INS	EXT INS
0.074	HC ≥ 5	18	0.077	0.10
	HC ≥ 10	18	0.086	0.12
	HC ≥ 15	18	0.093	0.13
	HC ≥ 5	61	0.077	0.10
	HC ≥ 10	61	0.085	0.12
	HC ≥ 15	61	0.092	0.12

	Min R-Value		
WALL BELOW GRADE:	10		
UNHEATED SLAB ON GRADE:	24"	36"	48"
Horizontal	18	15	11
Vertical	8	6	4

	Max Uo
ROOF:	0.049
WALL ADJACENT TO UNCOND SPACE:	0.12
FLOOR OVER UNCOND SPACE:	0.041

ALTERNATE COMPONENT PACKAGES FOR:

HDD50 = 4001 - 5000
CDD65 = 0 - 1150
VSEW = 560 - 845

Alpena MI, Bangor ME, Burlington VT, Cutbank MT, Eau Claire WI, Greenbay WI, Huron SD, Madison WI, Mason City IA, Massena NY, Miles City MT, Minneapolis MN, Pierre SD, Rochester NY, Sioux Falls SD

TABLE 5.4-26

Uof — BASE CASE; PERIMETER DAYLIGHTING: N/A, VLT ≥ SC

INTERNAL LOAD DENSITY (ILD) RANGE	PROJECTION FACTOR (PF)	SHADING COEFF RANGE (SCx)	BASE CASE 0.68 to 0.46	BASE CASE 0.45 to 0.29	BASE CASE 0.28 to 0
0 - 1.50	0.000 - 0.249	1.000 - 0.71	19	26	31
		0.709 - 0.60	21	29	37
		0.599 - 0.50	21	31	42
		0.499 - 0.38	22	33	48
		0.379 - 0.25	22	35	55
		0.249 - 0.00	22	36	62
	0.250 - 0.499	1.000 - 0.71	21	31	40
		0.709 - 0.60	22	33	47
		0.599 - 0.50	22	34	52
		0.499 - 0.38	22	35	56
		0.379 - 0.00	23	36	62
	0.500 +	1.000 - 0.71	22	34	49
		0.709 - 0.60	23	36	55
		0.599 - 0.50	23	36	59
		0.499 - 0.00	23	37	63
1.51 - 3.00	0.000 - 0.249	1.000 - 0.71	18	23	26
		0.709 - 0.60	20	26	31
		0.599 - 0.50	21	29	36
		0.499 - 0.38	22	31	42
		0.379 - 0.25	24	35	50
		0.249 - 0.00	25	39	61
	0.250 - 0.499	1.000 - 0.71	21	28	33
		0.709 - 0.60	22	31	40
		0.599 - 0.50	23	33	45
		0.499 - 0.38	24	35	50
		0.379 - 0.00	25	38	58
	0.500 +	1.000 - 0.71	23	32	41
		0.709 - 0.60	24	35	48
		0.599 - 0.50	25	36	53
		0.499 - 0.00	25	38	58

OPAQUE WALL Uow

ILD RANGE	LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0 - 1.50	0.069	HC ≥ 5	19	0.070	0.085
		HC ≥ 10	19	0.074	0.094
		HC ≥ 15	19	0.078	0.096
		HC ≥ 5	63	0.071	0.087
		HC ≥ 10	63	0.075	0.096
		HC ≥ 15	63	0.079	0.099
1.51 - 3.00	0.069	HC ≥ 5	18	0.071	0.090
		HC ≥ 10	18	0.076	0.10
		HC ≥ 15	18	0.080	0.10
		HC ≥ 5	61	0.070	0.089
		HC ≥ 10	61	0.075	0.10
		HC ≥ 15	61	0.079	0.10

3.01 - 3.50

0.000 - 0.249	1.000 - 0.71	17	21	23
	0.709 - 0.60	19	24	29
	0.599 - 0.50	20	27	33
	0.499 - 0.38	22	30	38
	0.379 - 0.25	24	33	46
	0.249 - 0.00	26	38	58
0.250 - 0.499	1.000 - 0.71	20	26	30
	0.709 - 0.60	22	29	37
	0.599 - 0.50	23	31	41
	0.499 - 0.38	24	34	47
	0.379 - 0.00	25	37	55
0.500 +	1.000 - 0.71	22	30	38
	0.709 - 0.60	23	33	44
	0.599 - 0.50	24	35	50
	0.499 - 0.00	25	37	55

Uow (HC<5)	HC RANGE	PCT FEN	INT INS	EXT INS
0.069	HC ≥ 5	17	0.071	0.092
	HC ≥ 10	17	0.077	0.10
	HC ≥ 15	17	0.082	0.10
	HC ≥ 5	58	0.070	0.091
	HC ≥ 10	58	0.076	0.10
	HC ≥ 15	58	0.080	0.10

Daylight Sensing Controls

	Min R-Value		
WALL BELOW GRADE:	11		
UNHEATED SLAB ON GRADE:	24"	36"	48"
Horizontal	18	15	11
Vertical	8	6	4

	Max Uo
ROOF:	0.045
WALL ADJACENT TO UNCOND SPACE:	0.11
FLOOR OVER UNCOND SPACE:	0.040

ALTERNATE COMPONENT PACKAGES FOR:

HDD50 = 3201 - 4000
CDD65 = 0 - 1150
VSEW = > 846

Casper WY
Cheyenne WY
Elko NV
Ely NV
North Platte NE
Pocatello ID
Scottsbluff NE

TABLE 5.4-27

INTERNAL LOAD DENSITY (ILD) RANGE	PROJECTION FACTOR (PF)	SHADING COEFF RANGE (SCx)	Uof: BASE CASE 0.68 to 0.46	BASE CASE 0.45 to 0.29	BASE CASE 0.28 to 0	PERIMETER DAYLIGHTING 0.68 to 0.46	PERIMETER DAYLIGHTING 0.45 to 0	PERIMETER DAYLIGHTING 0.28 to 0 (VLT ≥ SC)
0 - 1.50	0.000 - 0.249	1.000 - 0.71	19	26	30	19	26	32
		0.709 - 0.60	20	28	36	19	29	38
		0.599 - 0.50	20	30	41	19	30	43
		0.499 - 0.38	20	32	46	19	31	48
		0.379 - 0.25	20	33	53	19	32	54
		0.249 - 0.00	20	33	60	19	32	57
	0.250 - 0.499	1.000 - 0.71	21	31	39	20	31	42
		0.709 - 0.60	21	33	46	20	32	49
		0.599 - 0.50	21	34	51	20	33	53
		0.499 - 0.38	21	34	56	20	33	57
		0.379 - 0.00	21	34	61	20	33	60
	0.500 +	1.000 - 0.71	22	34	49	21	34	52
		0.709 - 0.60	22	35	55	20	34	58
		0.599 - 0.50	21	36	60	20	34	61
		0.499 - 0.00	21	36	63	20	34	62
1.51 - 3.00	0.000 - 0.249	1.000 - 0.71	18	22	24	20	27	32
		0.709 - 0.60	20	25	30	21	30	38
		0.599 - 0.50	21	28	34	22	32	44
		0.499 - 0.38	22	31	40	23	34	49
		0.379 - 0.25	23	34	48	23	36	57
		0.249 - 0.00	25	38	59	24	38	64
	0.250 - 0.499	1.000 - 0.71	21	27	32	22	32	42
		0.709 - 0.60	22	30	38	23	34	49
		0.599 - 0.50	23	33	43	23	36	55
		0.499 - 0.38	24	35	49	24	37	60
		0.379 - 0.00	25	38	57	24	38	65
	0.500 +	1.000 - 0.71	23	32	40	23	36	52
		0.709 - 0.60	24	35	47	24	37	59
		0.599 - 0.50	25	36	52	24	38	64
		0.499 - 0.00	25	38	58	24	39	67

OPAQUE WALL Uow

ILD 0 - 1.50:

LIGHT WEIGHT WALL: Uow (HC<5)	MASS WALL: HC RANGE	PCT FEN	INT INS	EXT INS
0.073	HC ≥ 5	19	0.076	0.10
	HC ≥ 10	19	0.085	0.12
	HC ≥ 15	19	0.092	0.12
	HC ≥ 5	63	0.078	0.10
	HC ≥ 10	63	0.086	0.12
	HC ≥ 15	63	0.095	0.13

ILD 1.51 - 3.00:

LIGHT WEIGHT WALL: Uow (HC<5)	MASS WALL: HC RANGE	PCT FEN	INT INS	EXT INS
0.073	HC ≥ 5	18	0.077	0.11
	HC ≥ 10	18	0.088	0.13
	HC ≥ 15	18	0.098	0.14
	HC ≥ 5	67	0.078	0.10
	HC ≥ 10	67	0.087	0.12
	HC ≥ 15	67	0.096	0.13

3.01 - 3.50

0.000 - 0.249	1.000 - 0.71	16	19	21	20	26	31
	0.709 - 0.60	18	23	26	21	30	38
	0.599 - 0.50	20	25	30	22	32	43
	0.499 - 0.38	21	28	35	23	34	49
	0.379 - 0.25	23	32	43	24	36	57
	0.249 - 0.00	25	36	55	25	38	64
0.250 - 0.499	1.000 - 0.71	19	24	28	22	31	41
	0.709 - 0.60	21	28	34	23	34	48
	0.599 - 0.50	22	30	39	23	35	54
	0.499 - 0.38	23	33	44	24	37	59
	0.379 - 0.00	24	36	52	25	38	65
0.500 +	1.000 - 0.71	21	29	36	23	35	51
	0.709 - 0.60	23	32	42	24	37	58
	0.599 - 0.50	24	34	47	24	38	63
	0.499 - 0.00	24	36	53	25	39	66

Daylight Sensing Controls

Uow (HC<5)	HC RANGE	PCT FEN	INT INS	EXT INS
0.073	HC ≥ 5	10	0.077	0.11
	HC ≥ 10	10	0.089	0.14
	HC ≥ 15	10	0.10	0.15
	HC ≥ 5	60	0.077	0.10
	HC ≥ 10	60	0.086	0.12
	HC ≥ 15	60	0.095	0.13

	Min R-Value		
WALL BELOW GRADE:	10		
UNHEATED SLAB ON GRADE:	24"	36"	48"
Horizontal	18	15	11
Vertical	8	6	4

	Max Uo
ROOF:	0.049
WALL ADJACENT TO UNCOND SPACE:	0.12
FLOOR OVER UNCOND SPACE:	0.042

ALTERNATE COMPONENT PACKAGES FOR:

HDD50 = 4001 - 5000
CDD65 = 0 - 1150
VSEW = > 845

Bryce UT
Eagle CO
Rock Springs WY

TABLE 5.4-28

INTERNAL LOAD DENSITY (ILD) RANGE	PROJECTION FACTOR (PF)	SHADING COEFF RANGE (SCx)	BASE CASE Uof 0.68 to 0.46	BASE CASE Uof 0.45 to 0.29	BASE CASE Uof 0.28 to 0	PERIMETER DAYLIGHTING N/A	PERIMETER DAYLIGHTING VLT ≥ SC
0 - 1.50	0.000 - 0.249	1.000 - 0.71	16	30	40		
		0.709 - 0.60	14	29	47		
		0.599 - 0.50	13	27	51		
		0.499 - 0.38	11	24	53		
		0.379 - 0.25	10	20	51		
		0.249 - 0.00	8	16	40		
	0.250 - 0.499	1.000 - 0.71	15	31	51		
		0.709 - 0.60	13	28	56		
		0.599 - 0.50	11	25	57		
		0.499 - 0.38	10	22	56		
		0.379 - 0.00	9	18	48		
	0.500 +	1.000 - 0.71	13	30	59		
		0.709 - 0.60	11	25	60		
		0.599 - 0.50	10	22	58		
		0.499 - 0.00	9	19	53		
1.51 - 3.00	0.000 - 0.249	1.000 - 0.71	17	26	32		
		0.709 - 0.60	17	27	38		
		0.599 - 0.50	17	28	42		
		0.499 - 0.38	17	28	46		
		0.379 - 0.25	16	27	49		
		0.249 - 0.00	15	26	49		
	0.250 - 0.499	1.000 - 0.71	18	29	41		
		0.709 - 0.60	17	29	46		
		0.599 - 0.50	17	29	49		
		0.499 - 0.38	16	28	51		
		0.379 - 0.00	16	27	52		
	0.500 +	1.000 - 0.71	18	30	49		
		0.709 - 0.60	17	30	52		
		0.599 - 0.50	17	29	54		
		0.499 - 0.00	16	28	54		

OPAQUE WALL Uow

ILD 0 - 1.50:

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.064	HC ≥ 5	16	0.065	0.086
	HC ≥ 10	16	0.070	0.10
	HC ≥ 15	16	0.075	0.10
	HC ≥ 5	60	0.066	0.10
	HC ≥ 10	60	0.074	0.12
	HC ≥ 15	60	0.083	0.13

ILD 1.51 - 3.00:

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.064	HC ≥ 5	17	0.066	0.093
	HC ≥ 10	17	0.072	0.11
	HC ≥ 15	17	0.079	0.11
	HC ≥ 5	54	0.066	0.094
	HC ≥ 10	54	0.073	0.11
	HC ≥ 15	54	0.080	0.12

3.01 - 3.50

0.000 - 0.249	1.000 - 0.71	17	24	29
	0.709 - 0.60	17	25	34
	0.599 - 0.50	17	26	38
	0.499 - 0.38	17	27	42
	0.379 - 0.25	17	27	46
	0.249 - 0.00	18	27	49
0.250 - 0.499	1.000 - 0.71	18	27	37
	0.709 - 0.60	18	28	42
	0.599 - 0.50	17	28	45
	0.499 - 0.38	17	28	48
	0.379 - 0.00	17	28	50
0.500 +	1.000 - 0.71	18	29	44
	0.709 - 0.60	18	29	48
	0.599 - 0.50	17	29	51
	0.499 - 0.00	17	29	52

Uow (HC<5)	HC RANGE	PCT FEN	INT INS	EXT INS
0.064	HC ≥ 5	17	0.066	0.095
	HC ≥ 10	17	0.073	0.11
	HC ≥ 15	17	0.080	0.12
	HC ≥ 5	52	0.066	0.096
	HC ≥ 10	52	0.073	0.11
	HC ≥ 15	52	0.080	0.12

Daylight Sensing Controls

	Min R-Value		
WALL BELOW GRADE:	11		
UNHEATED SLAB ON GRADE:	24"	36"	48"
Horizontal	18	15	11
Vertical	8	6	4

	Max Uo
ROOF:	0.045
WALL ADJACENT TO UNCOND SPACE:	0.11
FLOOR OVER UNCOND SPACE:	0.040

ALTERNATE COMPONENT PACKAGES FOR:

HDD50 = 5001 - 6500
CDD65 = 0 - 1150
VSEW = 500 - 845

Bismarck ND
Caribou ME
Duluth MN
Fargo ND
Glasgow MT
International Falls MN
Minot ND
Sault Sainte Marie MI

TABLE 6.4-29

INTERNAL LOAD DENSITY (ILD) RANGE	PROJECTION FACTOR (PF)	SHADING COEFF RANGE (SCx)	BASE CASE Uof 0.68 to 0.46	BASE CASE Uof 0.45 to 0.29	BASE CASE Uof 0.28 to 0	PERIMETER DAYLIGHTING N/A	VLT ≥ SC
0 - 1.50	0.000 - 0.249	1.000 - 0.71	19	28	37		
		0.709 - 0.60	19	30	43		
		0.599 - 0.50	19	31	47		
		0.499 - 0.38	19	31	51		
		0.379 - 0.25	18	31	55		
		0.249 - 0.00	18	30	57		
	0.250 - 0.499	1.000 - 0.71	20	31	46		
		0.709 - 0.60	19	32	51		
		0.599 - 0.50	19	32	55		
		0.499 - 0.38	19	32	57		
		0.379 - 0.00	18	31	59		
	0.500 +	1.000 - 0.71	20	33	53		
		0.709 - 0.60	19	33	58		
		0.599 - 0.50	19	32	59		
		0.499 - 0.00	19	32	60		
1.51 - 3.00	0.000 - 0.249	1.000 - 0.71	18	25	31		
		0.709 - 0.60	19	28	36		
		0.599 - 0.50	20	29	41		
		0.499 - 0.38	20	31	46		
		0.379 - 0.25	21	33	52		
		0.249 - 0.00	21	34	58		
	0.250 - 0.499	1.000 - 0.71	20	29	39		
		0.709 - 0.60	21	31	45		
		0.599 - 0.50	21	32	49		
		0.499 - 0.38	21	33	53		
		0.379 - 0.00	21	34	58		
	0.500 +	1.000 - 0.71	21	32	46		
		0.709 - 0.60	21	33	52		
		0.599 - 0.50	21	34	55		
		0.499 - 0.00	22	34	58		

OPAQUE WALL Uow

ILD 0 - 1.50:

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.064	HC ≥ 5	19	0.065	0.077
	HC ≥ 10	19	0.068	0.083
	HC ≥ 15	19	0.070	0.085
	HC ≥ 5	60	0.065	0.078
	HC ≥ 10	60	0.068	0.085
	HC ≥ 15	60	0.070	0.087

ILD 1.51 - 3.00:

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.064	HC ≥ 5	18	0.065	0.081
	HC ≥ 10	18	0.069	0.090
	HC ≥ 15	18	0.072	0.093
	HC ≥ 5	58	0.065	0.081
	HC ≥ 10	58	0.068	0.089
	HC ≥ 15	58	0.072	0.092

3.01 - 3.50

0.000 - 0.249	1.000 - 0.71	18	24	28
	0.709 - 0.60	19	27	34
	0.599 - 0.50	20	29	39
	0.499 - 0.38	21	30	44
	0.379 - 0.25	21	33	50
	0.249 - 0.00	22	35	58
0.250 - 0.499	1.000 - 0.71	20	28	36
	0.709 - 0.60	21	30	42
	0.599 - 0.50	21	32	47
	0.499 - 0.38	22	33	51
	0.379 - 0.00	22	35	57
0.500 +	1.000 - 0.71	21	31	44
	0.709 - 0.60	22	33	50
	0.599 - 0.50	22	34	53
	0.499 - 0.00	22	35	57

Uow (HC<5)	HC RANGE	PCT FEN	INT INS	EXT INS
0.064	HC ≥ 5	10	0.065	0.083
	HC ≥ 10	10	0.069	0.092
	HC ≥ 15	10	0.073	0.096
	HC ≥ 5	50	0.065	0.082
	HC ≥ 10	50	0.069	0.091
	HC ≥ 15	50	0.072	0.094

Daylight Sensing Controls

	Min R-Value		
WALL BELOW GRADE:	12		
UNHEATED SLAB ON GRADE:	24"	36"	48"
Horizontal	18	15	11
Vertical	8	6	4

	Max Uo
ROOF:	0.041
WALL ADJACENT TO UNCOND SPACE:	0.10
FLOOR OVER UNCOND SPACE:	0.040

ALTERNATE COMPONENT PACKAGES FOR:

HDD65 = 1 - 6500
CDD65 = < 100
VSEW = < 500

Adak AK
Anchorage AK
Annette AK
Juneau AK
Kodiak AK

Yakutat AK

TABLE 5.4-30

ILD 0 - 1.50 (Adak AK, Anchorage AK, Annette AK, Juneau AK, Kodiak AK)

INTERNAL LOAD DENSITY (ILD) RANGE	PROJECTION FACTOR (PF)	SHADING COEFF RANGE (SCx)	BASE CASE Uof 0.68 to 0.46	BASE CASE Uof 0.45 to 0.29	BASE CASE Uof 0.28 to 0	PERIMETER DAYLIGHTING N/A	PERIMETER DAYLIGHTING VLT ≥ SC
0 - 1.50	0.000 - 0.249	1.000 - 0.71	17	29	45		
		0.709 - 0.60	18	29	50		
		0.599 - 0.50	15	28	53		
		0.499 - 0.38	14	27	55		
		0.379 - 0.25	13	25	53		
		0.249 - 0.00	12	22	48		
	0.250 - 0.499	1.000 - 0.71	16	30	53		
		0.709 - 0.60	15	28	58		
		0.599 - 0.50	14	27	57		
		0.499 - 0.38	14	25	56		
		0.379 - 0.00	13	23	52		
	0.500 +	1.000 - 0.71	15	29	58		
		0.709 - 0.60	14	27	58		
		0.599 - 0.50	14	25	57		
		0.499 - 0.00	13	24	54		

OPAQUE WALL Uow

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.066	HC ≥ 5	17	0.066	0.071
	HC ≥ 10	17	0.069	0.075
	HC ≥ 15	17	0.071	0.076
	HC ≥ 5	58	0.067	0.073
	HC ≥ 10	58	0.069	0.078
	HC ≥ 15	58	0.072	0.080

ILD 1.51 - 3.00 (Yakutat AK)

INTERNAL LOAD DENSITY (ILD) RANGE	PROJECTION FACTOR (PF)	SHADING COEFF RANGE (SCx)	BASE CASE Uof 0.68 to 0.46	BASE CASE Uof 0.45 to 0.29	BASE CASE Uof 0.28 to 0	PERIMETER DAYLIGHTING N/A	PERIMETER DAYLIGHTING VLT ≥ SC
1.51 - 3.00	0.000 - 0.249	1.000 - 0.71	17	27	39		
		0.709 - 0.60	17	28	44		
		0.599 - 0.50	17	28	48		
		0.499 - 0.38	16	28	50		
		0.379 - 0.25	16	27	52		
		0.249 - 0.00	15	26	51		
	0.250 - 0.499	1.000 - 0.71	17	29	47		
		0.709 - 0.60	17	29	51		
		0.599 - 0.50	16	28	53		
		0.499 - 0.38	16	28	54		
		0.379 - 0.00	15	27	53		
	0.500 +	1.000 - 0.71	17	29	53		
		0.709 - 0.60	16	29	55		
		0.599 - 0.50	16	28	55		
		0.499 - 0.00	16	27	55		

OPAQUE WALL Uow

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.066	HC ≥ 5	17	0.066	0.074
	HC ≥ 10	17	0.070	0.082
	HC ≥ 15	17	0.073	0.084
	HC ≥ 5	55	0.066	0.075
	HC ≥ 10	55	0.070	0.082
	HC ≥ 15	55	0.073	0.084

3.01 - 3.50

0.000 - 0.249	1.000 - 0.71	20	30	41	
	0.709 - 0.60	20	31	47	
	0.599 - 0.50	19	32	51	
	0.499 - 0.38	19	32	55	
	0.379 - 0.25	19	32	58	
	0.249 - 0.00	18	31	59	
0.250 - 0.499	1.000 - 0.71	20	32	50	
	0.709 - 0.60	20	33	55	
	0.599 - 0.50	19	33	58	
	0.499 - 0.38	19	32	60	
	0.379 - 0.00	19	32	61	
0.500 +	1.000 - 0.71	20	33	57	
	0.709 - 0.60	19	33	60	
	0.599 - 0.50	19	33	62	
	0.499 - 0.00	19	32	62	

Uow (HC<5)	HC RANGE	PCT FEN	INT INS	EXT INS
0.066	HC ≥ 5	20	0.066	0.076
	HC ≥ 10	20	0.070	0.084
	HC ≥ 15	20	0.073	0.087
	HC ≥ 5	62	0.066	0.076
	HC ≥ 10	62	0.070	0.084
	HC ≥ 15	62	0.074	0.087

Daylight Sensing Controls

	Min R-Value		
WALL BELOW GRADE:	12		
UNHEATED SLAB ON GRADE:	24"	36"	48"
Horizontal	18	15	11
Vertical	8	6	4

	Max Uo
ROOF:	0.041
WALL ADJACENT TO UNCOND SPACE:	0.10
FLOOR OVER UNCOND SPACE:	0.040

ALTERNATE COMPONENT PACKAGES FOR:

HDD50 = > 6500
CDD65 = < 100
VSEW = < 500

Bethel AK
Big Delta AK
Fairbanks AK
Gulkana AK
King Salmon AK

McGrath AK
Nome AK
Summit AK

TABLE 5.4-31

INTERNAL LOAD DENSITY (ILD) RANGE	PROJECTION FACTOR (PF)	SHADING COEFF RANGE (SCx)	Uof BASE CASE 0.60 to 0.46	Uof BASE CASE 0.45 to 0.29	Uof BASE CASE 0.28 to 0	PERIMETER DAYLIGHTING N/A	PERIMETER DAYLIGHTING VLT ≥ SC
0 - 1.50	0.000 - 0.249	1.000 - 0.71	16	30	49		
		0.709 - 0.60	15	28	53		
		0.599 - 0.50	14	27	54		
		0.499 - 0.38	13	25	54		
		0.379 - 0.25	12	23	50		
		0.249 - 0.00	11	20	43		
	0.250 - 0.499	1.000 - 0.71	15	29	55		
		0.709 - 0.60	14	27	56		
		0.599 - 0.50	13	25	55		
		0.499 - 0.38	12	23	52		
		0.379 - 0.00	12	21	47		
	0.500 +	1.000 - 0.71	14	27	57		
		0.709 - 0.60	13	25	55		
		0.599 - 0.50	12	23	52		
		0.499 - 0.00	12	22	48		
1.51 - 3.00	0.000 - 0.249	1.000 - 0.71	17	27	41		
		0.709 - 0.60	16	27	46		
		0.599 - 0.50	16	27	48		
		0.499 - 0.38	15	26	49		
		0.379 - 0.25	15	25	49		
		0.249 - 0.00	14	24	46		
	0.250 - 0.499	1.000 - 0.71	16	28	48		
		0.709 - 0.60	16	27	50		
		0.599 - 0.50	15	26	51		
		0.499 - 0.38	15	26	50		
		0.379 - 0.00	14	24	48		
	0.500 +	1.000 - 0.71	16	27	51		
		0.709 - 0.60	15	26	52		
		0.599 - 0.50	15	26	51		
		0.499 - 0.00	14	26	50		

OPAQUE WALL Uow (ILD 0 - 1.50)

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.053	HC ≥ 5	16	0.053	0.065
	HC ≥ 10	16	0.055	0.068
	HC ≥ 15	16	0.056	0.067
	HC ≥ 5	57	0.053	0.069
	HC ≥ 10	57	0.056	0.074
	HC ≥ 15	57	0.058	0.074

OPAQUE WALL Uow (ILD 1.51 - 3.00)

LIGHT WEIGHT WALL Uow (HC<5)	MASS WALL HC RANGE	PCT FEN	INT INS	EXT INS
0.053	HC ≥ 5	17	0.053	0.068
	HC ≥ 10	17	0.055	0.072
	HC ≥ 15	17	0.057	0.072
	HC ≥ 5	52	0.053	0.069
	HC ≥ 10	52	0.056	0.074
	HC ≥ 15	52	0.057	0.073

3.01 - 3.50

0.000 - 0.249	1.000 - 0.71	18	29	42
	0.709 - 0.60	18	30	48
	0.599 - 0.50	18	30	51
	0.499 - 0.38	17	29	53
	0.379 - 0.25	17	29	54
	0.249 - 0.00	16	28	52
0.250 - 0.499	1.000 - 0.71	18	30	50
	0.709 - 0.60	18	30	53
	0.599 - 0.50	18	30	55
	0.499 - 0.38	17	29	55
	0.379 - 0.00	17	28	54
0.500 +	1.000 - 0.71	18	30	54
	0.709 - 0.60	18	30	56
	0.599 - 0.50	17	29	56
	0.499 - 0.00	17	29	55

Uow (HC<5)	HC RANGE	PCT FEN	INT INS	EXT INS
0.053	HC ≥ 5	18	0.053	0.069
	HC ≥ 10	18	0.055	0.074
	HC ≥ 15	18	0.057	0.074
	HC ≥ 5	56	0.054	0.069
	HC ≥ 10	56	0.055	0.073
	HC ≥ 15	56	0.057	0.072

Daylight Sensing Controls

	Min R-Value		
WALL BELOW GRADE:	16		
UNHEATED SLAB ON GRADE:	24"	36"	48"
Horizontal	18	15	11
Vertical	8	6	4

	Max Uo
ROOF:	0.031
WALL ADJACENT TO UNCOND SPACE:	0.087
FLOOR OVER UNCOND SPACE:	0.040

Table 5.4-1
Climate Data Grouped by ACP Tables

ACP Table Number	HDD50 Range	CDD65 Range	VSEW Range	CDH80 Range	Example Cities
5.4-2	0	3001-4500	>800		Barbers Point, Hilo, Honolulu, Lihue
5.4-3	0	>4500	>845		Guantanamo Bay, Kwajalein, San Juan, Wake Island
5.4-4	1-1000	0-1150	560-845		Arcata, North Bend
5.4-5	1-1000	0- 300	>845		Oakland, San Francisco, Santa Maria, Sunnyville
5.4-6	1-1000	301-1150	>845		El Toro, Long Beach, Los Angeles, San Diego
5.4-7	1-1000	1151-2000	560-845		Atlanta, Augusta, Birmingham, Cherry Point, Greenville
5.4-8	1-1000	1151-2000	>845		Fresno, Red Bluff, Sacramento
5.4-9	1-1000	2001-3250	560-845		Charleston, Houston, Jackson, Montgomery, New Orleans
5.4-10	1-1000	2001-3250	>845	0-18000	Austin, Bakersfield, El Paso, Fort Worth, Tallahassee, Tampa
5.4-11	1-1000	2001-3250	>845	>18000	China Lake, Las Vegas, Tucson
5.4-12	1-1000	3251-4500	>845	0-18000	Brownsville, Corpus Christi, Miami, Orlando, West Palm Beach
5.4-13	1-1000	3251-4500	>845	>18000	Loredo, Phoenix, Yuma
5.4-14	1001-1750	0- 500	560-845		Olympia, Portland, Salem, Seattle/Tacoma, Whidbey Island
5.4-15	1001-1750	501-1150	560-845		Asheville, Medford
5.4-16	1001-1750	1-1150	>845		Prescott, Winslow, Yucca
5.4-17	1001-1750	1151-2000	560-845		Charlotte, Chattanooga, Knoxville, Norfolk, Raleigh, Richmond
5.4-18	1001-1750	1151-2000	>845		Albuquerque, Lubbock, Oklahoma City, Roswell, Tucumcari
5.4-19	1001-1750	2001-3250	560-845		Fort Smith, Memphis, Tulsa
5.4-20	1751-2600	0-1150	560-845		Baltimore, Boston, Columbus, Harrisburg, New York, Washington
5.4-21	2601-3200	0-1150	560-845		Akron, Chicago, Detroit, Hartford, Indianapolis, Pittsburgh
5.4-22	1751-3200	0-1150	>845		Boise, Colorado Springs, Denver, Reno, Salt Lake City
5.4-23	1751-3200	1151-2000	560-845		Evansville, Lexington, Louisville, Saint Louis, Springfield
5.4-24	1751-3200	1151-2000	>845		Dodge City, Grand Junction
5.4-25	3201-4000	0-1150	560-845		Albany, Buffalo, Concord, Des Moines, Milwaukee, Rapid City
5.4-26	4001-5000	0-1150	560-845		Bangor, Cutbank, Huron, Minneapolis, Rochester, Sioux Falls
5.4-27	3201-4000	0-1150	>845		Casper, Cheyenne, Ely, North Platte, Scottsbluff
5.4-28	4001-5000	0-1150	>845		Bryce, Eagle, Rock Springs
5.4-29	5001-6500	0-1150	560-845		Bismarck, Duluth, Fargo, Glasgow, International Falls
5.4-30	1-6500	< 100	<560		Adak, Anchorage, Juneau, Kodiak, Yakutat
5.4-31	>6500	< 100	<560		Bethel, Fairbanks, King Salmon, Nome, Summit

(b) From the list of cities in Appendix 5A, "List of Cities and Climate Data", which contains data for 234 cities, select the closest city climatologically to the building site. If the site is not one of the cities listed or if the climate at the site differs significantly from a listed adjacent city, obtain the information from the weather bureau or other reliable source and use (a) above. The column designated "ACP Table No." contains the table number of the appropriate ACP Table.

(c) For information purposes only, the climate data used to develop the ACP tables for the above-grade wall section are shown in Table 5.4–32. The criteria for all other envelope sections was based on the most stringent level for the cities listed in the ACP Table.

5.4.3.2.2 Determination of Maximum Allowable Percent Fenestration.

(a) Using the appropriate ACP Table, determine the maximum allowable percent fenestration. The maximum allowable percent fenestration is the total area of fenestration assemblies divided by the total gross exterior wall area, considering all elevations of the building. Determining the maximum allowable percent fenestration requires the following five steps:

(1) Based on the Internal Load Density (ILD) for the proposed design, select one of the three Internal Load Ranges as the point of entry to the tables. Note for ILD's greater than 3.5 W/ft^2 use the 3.5 W/ft^2 range. For shell buildings, see procedures in Section 5.3.8. Determine the ILD of the proposed design, based on the sum of the Internal Lighting Power Allowance (ILPA), the Equipment Power Density (EPD) and Occupant Load Adjustment (OLA), as shown in Equation 5.4–1.

ILD=ILPA+EPD+OLA

Equation 5.4–1

Where:

The Internal Lighting Power Allowance (ILPA) shall be:

1. The building average Internal Lighting Power Allowance (ILPA) of the design building in W/ft^2 as determined in Section 3.4 or 3.5;

2. The average of the Lighting Power Budgets (LPB) for all activity areas within 15 ft of each exterior wall based on the procedures specified by the Systems Performance Criteria of Section 3.5.3, or

3. The actual lighting power density of the proposed design in W/ft^2, either the building average or the average of the lighting power within 15 ft of each exterior wall.

NOTE.— The lighting prescriptive path, Section 3.4, does not provide lighting values for health, assembly, multi-family high rise, and hotel/motel buildings type occupancies. Use the 1.51 to 3.0 range of Internal Load Density for health and assembly buildings; and the 0 to 1.5 range for multi-family high rise and hotel/motel buildings.

The Equipment Power Density (EPD) shall be either:

1. The building average receptacle power density selected from Table 5.4–33 in W/ft^2; or

Table 5.4-33

Average Receptacle Power Densities

BUILDING TYPE	W/ft^2
1. Assembly	0.25
2. Office	0.75
3. Retail	0.25
4. Warehouse	0.10
5. School	0.50
6. Hotel/Motel	0.25
7. Restaurant	0.10
8. Health	1.00
9. Multi-Family	0.75

2. The actual average receptacle power density for all activity areas within 15 ft of each exterior wall in W/ft^2, considering diversity. For determining compliance in Tables 5.4–2 through 5.4–31, the actual average receptacle power densities calculated by this method that exceed 1.0 W/ft^2 shall be limited to 1.0 W/ft^2 in Equation 5.4–1.

The Occupant Load Adjustment (OLA) shall be either:

1. 0.0 W/ft^2. This recognizes the assumed occupant sensible load of 0.6 W/ft^2 that is built into the ACP tables; or

2. A positive or negative difference between the actual occupant load and 0.6 W/ft^2 if the design building has a larger or smaller occupant load.

(2) *Select external shading projection factor (PF).* If no external shading projections are used in the proposed design, select the column designated Projection Factor=0.000 − 0.249. If external shading projections are used, determine the average area weighted projection factor on the window in accordance with Equation 5.4–2. Then select the appropriate column in the ACP Table.

$$PF = P_d/H$$

Equation 5.4–2

Where:

PF=Average area weighted projection factor

P_d=External horizontal shading projection depth, in. or ft

H=Sum of height of the fenestration and the distance from the top of the fenestration to the bottom of external shading projection in units consistent with P_d.

(3) Select the Shading Coefficient of the fenestration (SC_x) including internal, integral, and external shading devices, but excluding the effect of external shading projections (PF). This includes curtains, shades, or blinds. Reference *ASHRAE Handbook, 1985 Fundamentals Volume*, Chapter 27.

(4) Select one of the daylighting options, either:

1. Base Case, no daylighting; or

2. Perimeter Daylighting (automatic daylight controls for lighting system must be used). This option is not available in some locations.

(5) Select appropriate fenestration type. For most options, this is determined by the thermal transmittance value (U_{of}) of the fenestration assembly. For some fenestration options, the visible light transmittance (VLT) of the fenestration should not be less than the shading coefficient of the glazed portion of the fenestration assembly, not considering any shading devices. The ranges generally correspond to single glazing, double glazing, triple glazing and high performance glazing incorporating low emissivity coatings/films or more than two glazing layers. Each ACP table includes at most, three ranges of glazing U-value.

5.4.4.2.3 *Determine the Maximum U_{ow} for the Opaque Wall Assembly*. In the appropriate ACP Table the Maximum U_{ow} for the opaque wall assembly is determined using the following steps:

(a) For a lightweight wall assembly, heat capacity (HC) less than 5 Btu/ft^2• °F, use the value indicated. This U_{ow} is constant over all internal load ranges.

(b) To use the mass wall adjustment, the following additional steps are necessary:

(1) Select the same internal load range as that used in determining the maximum allowable percent fenestration.

(2) Select the mass wall heat capacity (HC) and insulation position. If the wall insulation is positioned internal to or integral with the wall mass, use the column headed Interior/Integral Insulation. If the wall insulation is positioned external to the wall mass use the column headed Exterior Insulation. For HC less than 5 Btu/ft^2• °F this adjustment table cannot be used. At this step you will have two choices of U_{ow} that are keyed to a small or large percent fenestration. This represents the full range of U_{ow} values allowed.

(3) Select or interpolate the appropriate maximum U_{ow} for the opaque wall based on the maximum allowable percent fenestration determined in Section 5.4.4.2.2 or the actual building percent fenestration whichever value is lower. The U_{ow} shall be determined by straight line interpolation for fenestration percentages between the smallest and largest values listed. If the design building percentage fenestration is less than the smallest value listed, select the U_{ow} for the largest percentage fenestration listed.

5.4.4.2.4 *Determine Other Envelope Criteria*. In each ACP table, the criteria for roof, wall adjacent to unconditioned space, wall below grade (first story only), floor over unconditioned space, and slab-on-grade floors, shall be met. For heated slabs on grade, the R-value shall be the R-value for the unheated slab-on-grade plus 2.0. For skylights, the daylight credit procedure presented in Section 5.3.10 shall be used.

5.5 Building Envelope—System Performance Compliance Alternative

5.5.1 Roof Thermal Transmittance Criteria

5.5.1.1 Any building that is heated and/or mechanically cooled shall have an overall thermal transmittance value (U_{or}) for the gross area of the roof assembly not greater than the value determined by Equation 5.5–1. The provisions of Section 5.3 shall be followed in determining acceptable combinations of materials that will meet the required U_{or} values of Equation 5.5–1.

$$U_o=1/(5.3+1.8\times10^{-3}\times HDD65+1.3\times10^{-3}\times CDD65+2.6\times10^{-4}\times CDH80)$$

Equation 5.5–1

5.5.1.2 Equation 5.5–1 applies only for climate locations with HDD65 less than or equal to 15,000. For climate locations with HDD65 greater than 15,000, see subsection 5.3.9, Table 5.3–5.

5.5.1.2.1 *Exceptions to Section 5.5.1.2:*

(a) any building that is only heated shall have an overall thermal transmittance value (U_{or}) for the gross area of the roof assembly less than or equal to the value determined by Equation 5.5–1 with CDD65 and CDH80 set equal to zero; and

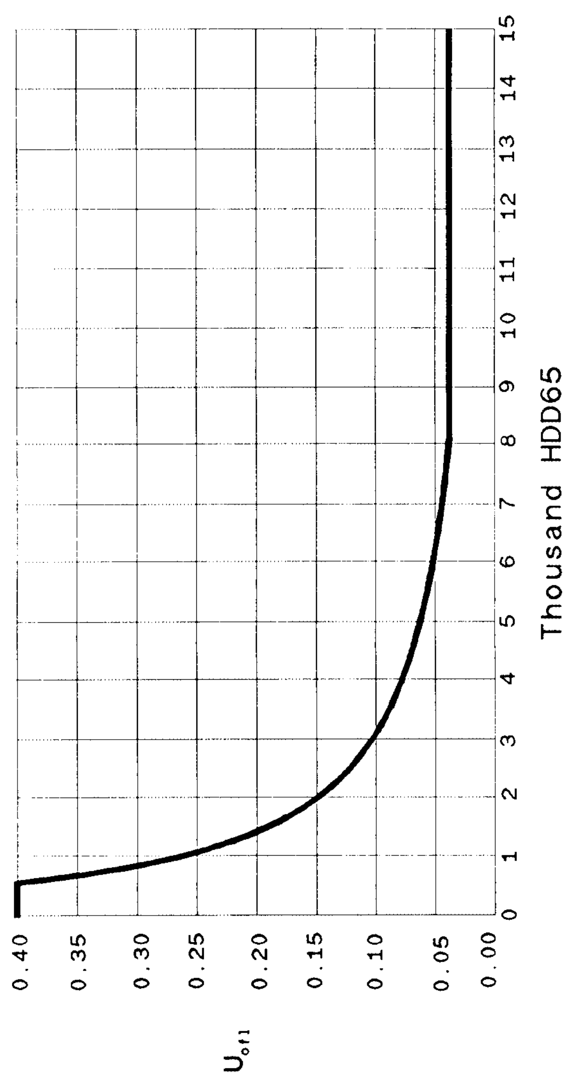
(b) any building that is only mechanically cooled shall have an overall thermal transmittance value (U_{or}) for the gross area of the roof assembly less than or equal to the value determined by Equation 5.5–1 with HDD65 set equal to zero.

5.5.2 Floor Thermal Transmittance Criteria

5.5.2.1 The floors of any building that is heated and/or mechanically cooled shall meet the following thermal criteria:

5.5.2.1.1 Floors of conditioned spaces over unconditioned spaces shall have a thermal transmittance (U_{of}) not greater than that specified in Figure 5.5–1.

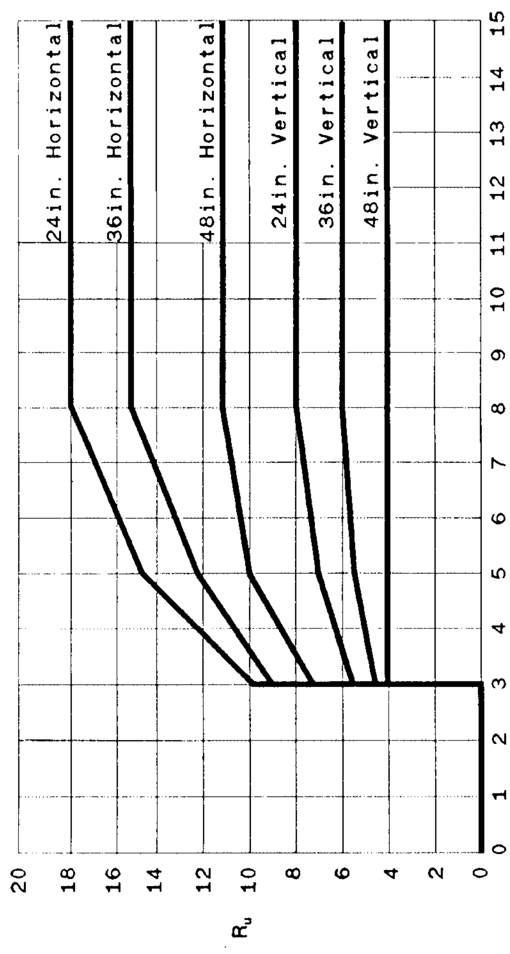
Figure 5.5–1
Maximum Overall Thermal Transmittance for Floors of Conditioned Spaces Over Unconditioned Spaces



Note:
for HDD65 ≤ 550, U_{ofl} = 0.40
for 550 < HDD65 ≤ 8000, U_{ofl} = 1/[0.840 + 0.00302 x HDD65]
for 8000 < HDD65 < 15000, U_{ofl} = 0.04
for HDD65 ≥ 15000, see Table 5.3-5

5.5.2.1.2 Slab-on-grade floors shall have insulation around the perimeter of the floor with the thermal resistance (R_u) of the insulation as specified in Figure 5.5–2. The insulation specified in Figure 5.5–2 shall extend either in a vertical plane downward from the top of the slab for the minimum distance shown or downward to the bottom of the slab for the minimum distance shown then in a horizontal plane beneath the slab. The horizontal length, or vertical depth, of insulation required varies from 24 in. to 48 in. depending upon the R-value selected. For heated slabs, an R of 2 shall be added to the thermal resistance required in Figure 5.5–2.

Figure 5.5-2
Thermal Resistance for Unheated Slab on Grade



Note: for HDD65 ≤ 3000, R_u = 0
for 3000 > HDD65 > 15000, see graph above
for HDD65 ≥ 15000, see Table 5.3-5

R values for heated slab-on-grade = R unheated + 2;
$R_h = R_u + 2$

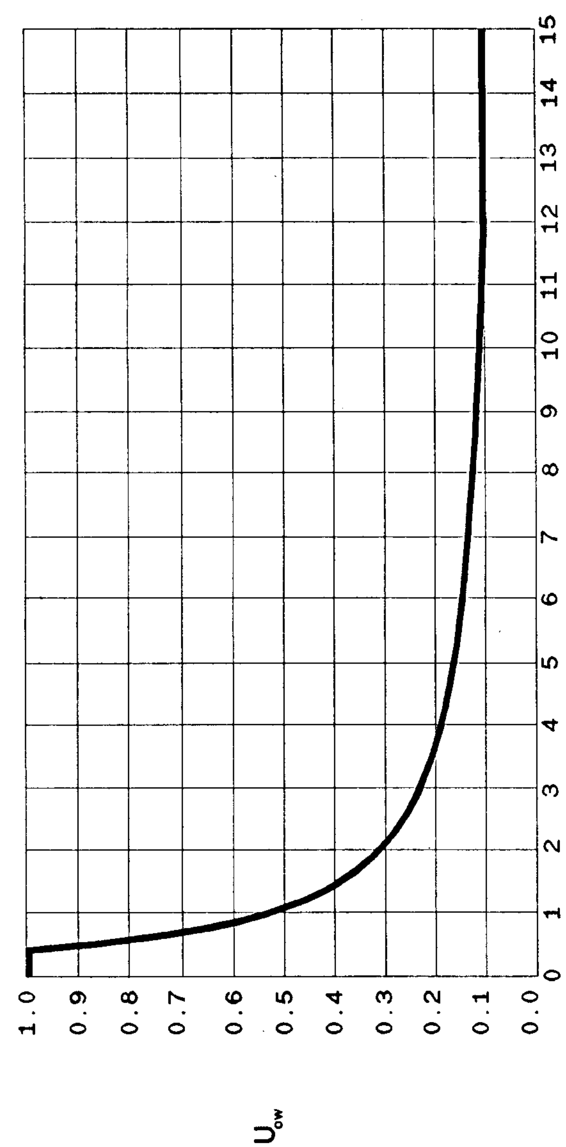
(a) Vertical insulation is not required to extend below the foundation footing. There are no insulation requirements for slabs in locations having less than 3,000 HDD65 for footings extending less than 18 in. below grade.

5.5.3 Thermal Transmittance Criteria For Opaque Walls Enclosing Conditioned Spaces Exposed to Interior Unconditioned Spaces

5.5.3.1 All opaque walls enclosing conditioned spaces exposed to interior unconditioned spaces shall have an overall thermal transmittance (U_{ow}) not greater than the value specified in Figure 5.5–3.

Figure 5.5-3

Maximum Overall Thermal Transmittance of Opaque Wall Sections With HC < 7



Note: for HDD65 ≤ 540, U_{ow} = 1.0

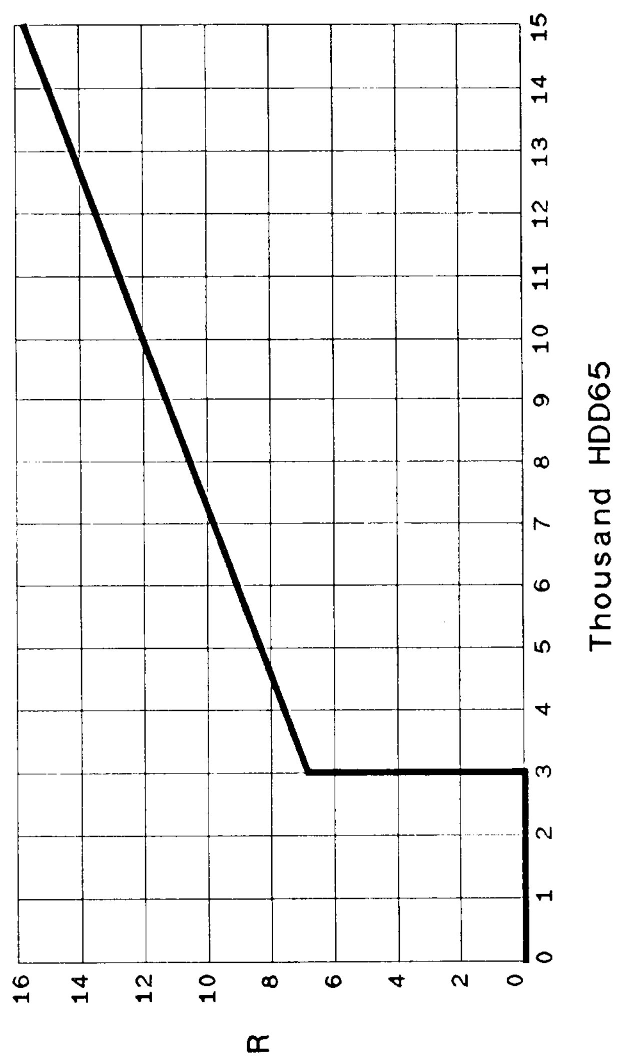
for 540 < HDD65 < 15000, U_{ow} = 0.0528 + 510.9/HDD65

for HDD65 ≥ 15000, see Table 5.3-5

5.5.4 Thermal Resistance Criteria for Exterior Wall Insulation Below Grade

5.5.4.1 The thermal resistance (R) of the wall assembly shall be greater than, or equal to the insulation level specified in Figure 5.5–4, or the heat loss calculated in accordance with Chapter 25 of the *ASHRAE Handbook, 1985 Fundamentals Volume* shall be less than, or equal to that of a wall below grade having a thermal resistance equal to that specified in Figure 5.5–4. No insulation is required for climate locations with less than 3,000 HDD65 for those portions of walls more than one story below grade.

Figure 5.5–4
Thermal Resistance of Wall
First Story Below Grade



Note: for HDD65 ≤ 3000, R = 0
for 3000 < HDD65 < 15000, R = 4.5 + 0.00075 x HDD65
for HDD65 ≥ 15000, see Table 5.3-5

5.5.5 External Wall Criteria for Heating and Cooling

5.5.5.1 The external wall heating criteria (WC_h) and cooling criteria (WC_c) represent limits on cumulative annual heating and cooling energy flux attributable to transmission and solar gain. These limits accommodate variation in internal load and wall heat capacity. They shall be determined for a building envelope design using Equations 5.5–2 and 5.5–6 in Attachment 5B, ''Equations to Determine External Wall Heating and Cooling Criteria (WC_c and WC_h) and to Determine Compliance (C_i and H_i) With the Criteria.''

5.5.6 Wall Heating and Cooling Compliance Values

5.5.6.1 The wall heating compliance value H_i and the wall cooling compliance value C_i are estimates of the cumulative annual heating and cooling energy flux attributable to heat transmission and solar gains. These estimates consider the effects of variations in internal load and wall heat capacity. They shall be calculated using Equations 5.5–2 and 5.5–6 in Attachment 5B.

5.5.6.3 Applying the Criteria

5.5.6.3.1 The wall criteria shall be applied as follows:

(a) For all buildings that are heated and mechanically cooled, the sum of the calculated wall heating and cooling compliance values, H_i and C_i, for all orientations of the proposed design, as determined in section 5.5.6, shall not exceed the sum of the corresponding wall criteria for all orientations for wall heating (WC_h) and wall cooling (WC_c).

(b) For buildings that are only heated, the sum of the calculated wall heating compliance values, H_i, for all orientations of the proposed design, as determined in section 5.5.6, shall not exceed the sum of the corresponding wall heating criterion WC_h for all orientations.

(c) For buildings that are only mechanically cooled, the sum of the calculated cooling compliance values, C_i, for all orientations of the proposed design, as determined from section 5.5.6, shall not exceed the sum of the corresponding wall cooling criteria, WC_c for all orientations.

5.5.6.4 Constraints on Thermal Transmittance Values

5.5.6.4.1 The compliance calculation procedure in section 5.5.6.3 allows great flexibility in selecting values for envelope components as long as the overall criteria are met. In calculating compliance, two constraints are imposed on thermal transmittance values for opaque wall assemblies and fenestration assemblies comprising the U_o term, as follows:

(a) *Opaque Wall Assemblies:* The opaque portion of walls with heat capacity (HC) less than 7 Btu/ft^2÷°F shall have an overall thermal transmittance (U_{ow}) not greater than the value specified in Figure 5.5–4. Procedures, specified in section 5.3, shall be used to determine acceptable combinations of materials that meet the required value.

(b) *Fenestration Assemblies:* The overall thermal transmittance (U_{of}) of fenestration assemblies shall not exceed 0.81 Btu/h•ft^2• °F for all locations with more than 3000 HDD65 if the fenestration area exceeds 10% of the total wall area exposed to the outside air. Thermal transmittance for the fenestration shall be determined using the calculation procedures in Section 5.3.1 and shall include the effects of sash, frames, edge effects, and spacers for multiple-glazed units.

5.5.6.5 Constraint on Daylighting Credit

5.5.6.5.1 For a given orientation, daylight credit may be used in Equations 5.5–2 and 5.5–6 only for that portion of the fenestration that is less than or equal to 65% of the gross wall area of the orientation.

5.5.6.6 Lighting Power Density

5.5.6.6.1 The Lighting Power Density used in calculating the compliance value shall be:

(a) The building average unit Interior Lighting Power Allowance of the proposed design in W/ft^2 as specified in section 3.0;

(b) The average of the Lighting Power Budgets for all activity areas within 15 ft of each exterior wall based on the procedures set forth in section 5.3; or

(c) The actual lighting power density of the proposed design in W/ft^2, either building average or average of the lighting power within 15 ft of each exterior wall.

5.5.6.7 Equipment Power Density

5.5.6.7.1 The equipment power density used in determining compliance shall be either:

(a) The ''Average Receptacle Power Densities'' from Table 5.4–32, or

(b) The actual average Equipment Unit Power Density, considering diversity, either building average or average in the activity areas within 15 ft of each exterior wall, not to exceed 1 W/ft^2.

5.5.6.8 Occupancy Loads

5.5.6.8.1 An occupancy load of 0.6 W/ft^2 is assumed. If the occupancy loads in the building design are different from this value, use the larger value.

Attachment 5A
List of Cities and Climate Data

NO	CITY	STATE	HDD50	HDD65	VSN	VSEW	VSS	CDD50	CDD65	CDH80	DR	NO HRS 8AM-4PM $T<55$	NO HRS 8AM-4PM $55 \le T \le 69$	ACP TABLE
Alabama														
28	Birmingham	AL	765	2882	464	789	908	5182	1825	6272	17.5	720	760	5.4- 7
143	Mobile	AL	164	1580	486	816	919	6478	2419	7479	16.6	408	774	5.4- 9
145	Montgomery	AL	491	2261	462	823	981	5821	2116	8473	19.5	609	734	5.4- 9
Alaska														
2	Adak	AK	3562	8913	280	434	652	124	0	0	9.9	2754	156	5.4-30
9	Anchorage	AK	5301	10540	272	538	926	236	0	0	13.8	2398	521	5.4-30
10	Annette Island	AK	2545	7277	285	482	739	756	12	0	10.1	2169	719	5.4-30
24	Bethel	AK	8285	13449	252	453	789	312	0	0	14.3	2555	347	5.4-31
25	Big Delta	AK	9355	14069	249	527	989	777	16	25	19.0	2141	606	5.4-31
76	Fairbanks	AK	9841	14414	241	492	919	922	19	8	18.2	2083	682	5.4-31
93	Gulkana	AK	8865	13846	257	522	943	498	4	6	18.5	2225	615	5.4-31
105	Juneau	AK	4223	9350	254	410	642	348	0	0	12.7	2367	540	5.4-30
106	King Salmon	AK	6843	11992	270	499	860	330	4	6	15.4	2395	502	5.4-31
109	Kodiak	AK	3775	8896	276	509	852	360	6	0	10.6	2519	384	5.4-30
132	McGrath	AK	9967	14868	246	467	841	578	3	0	15.9	2265	596	5.4-31
152	Nome	AK	9061	14418	242	478	871	119	0	0	9.0	2710	210	5.4-31
208	Summit	AK	9210	14530	247	488	893	155	0	0	13.6	2616	298	5.4-31
231	Yakutat	AK	4486	9714	247	402	650	248	0	0	9.3	2471	439	5.4-30
Arizona														
163	Phoenix	AZ	90	1382	488	1116	1310	7830	3647	34521	21.2	373	746	5.4-13
171	Prescott	AZ	1477	4462	473	1090	1334	3385	895	3973	24.0	1021	725	5.4-16
218	Tucson	AZ	178	1601	500	1112	1280	6822	2769	19657	21.9	399	716	5.4-11
229	Winslow	AZ	1695	4603	471	1092	1338	3708	1141	7347	27.7	1130	634	5.4-16
234	Yuma	AZ	43	782	493	1151	1330	8921	4186	37892	23.5	247	697	5.4-13
Arkansas														
79	Fort Smith	AR	1149	3394	462	842	1005	5307	2077	10413	22.4	925	547	5.4-19
121	Little Rock	AR	912	3091	465	831	981	5351	2055	8450	17.5	865	626	5.4- 9
California														
12	Arcata	CA	582	5020	407	724	926	1038	1	0	8.9	1396	1509	5.4- 4
19	Bakersfield	CA	305	2194	474	1053	1211	5879	2294	15447	28.9	645	848	5.4-10
48	China Lake	CA	409	2444	468	1091	1312	6222	2782	26739	27.4	582	772	5.4-11
58	Daggett	CA	237	1916	475	1102	1309	6516	2720	22302	27.0	472	841	5.4-11
71	El Toro	CA	32	1577	486	977	1163	4764	834	2391	22.3	215	1474	5.4- 6
82	Fresno	CA	492	2700	459	1029	1199	5070	1803	13085	31.8	780	785	5.4- 8
122	Long Beach	CA	54	1483	482	956	1144	4947	900	1616	16.1	263	1502	5.4- 6
123	Los Angeles	CA	3	1494	482	962	1146	4456	472	136	14.1	145	1849	5.4- 6
146	Mount Shasta	CA	1947	5583	419	909	1153	2395	556	2073	16.2	1544	756	5.4-22
156	Oakland	CA	157	2922	453	909	1102	2792	82	23	16.4	770	1905	5.4- 5
167	Point Mugu	CA	8	2193	477	936	1131	3435	145	70	12.3	209	2146	5.4- 5
176	Red Bluff	CA	589	2884	428	951	1177	5110	1930	14404	29.5	860	810	5.4- 8
185	Sacramento	CA	381	2753	444	987	1185	4274	1171	7315	34.6	834	990	5.4- 8
191	San Diego	CA	2	1275	490	950	1121	4865	662	383	11.5	102	1911	5.4- 6
192	San Francisco	CA	186	3238	454	941	1146	2496	73	204	20.2	782	1796	5.4- 5
194	Santa Maria	CA	138	3041	476	950	1128	2663	92	513	20.9	414	2016	5.4- 5
209	Sunnyville	CA	142	2708	456	947	1145	3112	204	421	16.9	610	1794	5.4- 5
Colorado														
50	Colorado Springs	CO	2587	5996	435	976	1321	2557	491	2075	24.0	1357	725	5.4-22
62	Denver	CO	2652	6083	428	971	1321	2611	567	2934	25.5	1329	739	5.4-22
68	Eagle	CO	4232	8317	432	976	1296	1480	90	1008	35.4	1650	660	5.4-28
86	Grand Junction	CO	2616	5701	438	1003	1303	3611	1221	6147	27.4	1383	518	5.4-24
173	Pueblo	CO	2223	5285	442	992	1309	3384	971	5899	27.5	1077	720	5.4-22
Connecticut														
95	Hartford	CT	2953	6277	384	646	834	2857	706	2197	23.7	1459	598	5.4-21
Delaware														
227	Wilmington	DE	2133	5084	414	726	921	3602	1078	2188	17.2	1289	617	5.4-20

C.1

NO	CITY	STATE	HDD50	HDD65	VSN	VSEW	VSS	CDD50	CDD65	CDH80	DR	NO HRS T<55	8AM-4PM 55≤T≤69	ACP TABLE
District of Columbia														
223	Washington	DC	2004	4828	419	724	905	3734	1083	3592	18.6	1205	657	5.4-20
Florida														
11	Apalachicola	FL	163	1366	508	887	971	6967	2695	8289	14.3	322	778	5.4-10
60	Daytona	FL	81	787	503	860	953	7404	2635	5252	14.8	177	641	5.4-10
104	Jacksonville	FL	206	1357	495	849	943	7045	2721	7488	16.4	354	674	5.4-10
136	Miami	FL	3	185	527	874	936	9338	4045	9166	12.4	55	259	5.4-12
160	Orlando	FL	33	532	511	881	974	8288	3312	9757	17.1	131	571	5.4-12
211	Tallahassee	FL	307	1721	495	845	944	6462	2401	7323	16.1	421	747	5.4-10
212	Tampa	FL	37	575	518	890	974	7985	3047	8905	14.9	147	592	5.4-10
224	West Palm Beach	FL	0	177	519	846	906	9203	3904	10324	13.1	22	308	5.4-12
Georgia														
15	Atlanta	GA	866	3070	467	807	930	4837	1566	3799	17.6	915	749	5.4- 7
16	Augusta	GA	664	2584	468	803	933	5458	1904	6904	21.3	690	774	5.4- 7
128	Macon	GA	514	2330	476	822	939	5769	2111	8097	18.7	667	787	5.4- 9
196	Savannah	GA	410	1967	474	805	926	6112	2194	6308	16.6	529	725	5.4- 9
Hawaii														
22	Barbers Point	HI	0	3	592	978	965	9314	3842	3617	11.2	1	97	5.4- 2
97	Hilo	HI	0	0	557	817	805	8494	3019	1112	11.0	0	153	5.4- 2
98	Honolulu	HI	0	0	588	953	932	9625	4150	4537	9.8	0	69	5.4- 2
120	Lihue	HI	0	2	567	895	893	9219	3746	1912	9.6	0	140	5.4- 2
Idaho														
30	Boise	ID	2276	5667	399	916	1228	2828	744	4512	28.9	1542	647	5.4-22
117	Lewiston	ID	2015	5426	370	729	988	2709	645	4121	29.7	1467	748	5.4-20
166	Pocatello	ID	3404	7075	405	935	1262	2330	526	3293	32.8	1681	546	5.4-27
Illinois														
47	Chicago	IL	3000	6151	402	729	936	3339	1015	3190	16.6	1426	613	5.4-21
144	Moline	IL	3085	6250	405	736	959	3204	894	2808	19.5	1357	640	5.4-21
207	Springfield	IL	2490	5448	422	768	962	3675	1158	4038	20.2	1260	600	5.4-23
Indiana														
75	Evansville	IN	1948	4625	426	736	890	4063	1265	4288	18.4	1141	611	5.4-23
80	Fort Wayne	IN	3023	6145	395	664	826	3096	743	1629	17.7	1400	601	5.4-21
101	Indianapolis	IN	2624	5620	407	692	851	3430	951	2263	18.0	1375	602	5.4-21
204	South Bend	IN	3038	6280	396	690	857	2917	684	1840	21.1	1415	635	5.4-21
Iowa														
35	Burlington	IA	3009	6094	419	802	1030	3393	1002	2598	17.1	1354	649	5.4-21
63	Des Moines	IA	3275	6447	413	788	1027	3116	812	2383	17.5	1423	667	5.4-25
130	Mason City	IA	4311	7735	400	783	1053	2708	658	1882	20.8	1548	610	5.4-26
202	Sioux City	IA	3608	6750	406	794	1064	3326	993	3488	18.6	1438	602	5.4-25
Kansas														
66	Dodge City	KS	2280	5131	450	942	1196	4008	1384	7186	26.0	1252	637	5.4-24
84	Goodland	KS	2757	6090	434	935	1228	3047	905	5147	26.3	1358	625	5.4-22
215	Topeka	KS	2458	5201	434	837	1068	4120	1388	5212	22.3	1192	608	5.4-23
Kentucky														
56	Covington	KY	2154	5030	408	687	843	3656	1057	2638	18.3	1316	661	5.4-20
119	Lexington	KY	1921	4649	425	729	872	3904	1157	2853	15.6	1211	618	5.4-23
124	Louisville	KY	1851	4539	424	727	883	4144	1357	4716	17.6	1192	636	5.4-23
Louisiana														
23	Baton Rouge	LA	237	1573	488	806	889	6682	2543	8814	17.2	440	677	5.4- 9
113	Lake Charles	LA	214	1455	489	795	864	6849	2615	7883	14.8	396	668	5.4- 9
148	New Orleans	LA	179	1392	497	838	923	6840	2578	7380	15.1	324	789	5.4- 9
201	Shreveport	LA	447	2265	484	843	954	6022	2365	10039	18.1	687	697	5.4- 9
Maine														
21	Bangor	ME	4132	7998	378	693	950	1853	243	454	21.5	1721	669	5.4-26
38	Caribou	ME	5297	9483	357	649	922	1410	121	203	18.1	1862	692	5.4-29
169	Portland	ME	3531	7305	376	643	856	1946	245	399	19.6	1604	665	5.4-25

C.2

NO	CITY	STATE	HDD50	HDD65	VSN	VSEW	VSS	CDD50	CDD65	CDH80	DR	NO HRS T<55	8AM-4PM 55≤T≤69	ACP TABLE
Maryland														
20	Baltimore	MD	2020	4946	419	739	932	3683	1134	3825	18.6	1268	593	5.4-20
161	Patuxent	MD	1418	4002	429	758	943	4180	1289	2966	12.9	1118	729	5.4-17
Massachusetts														
31	Boston	MA	2416	5775	387	659	849	2810	695	1601	16.5	1495	713	5.4-20
Michigan														
7	Alpena	MI	4282	8164	371	661	862	1928	335	894	17.3	1707	695	5.4-26
64	Detroit	MI	2799	5997	390	676	858	3199	922	2238	18.8	1404	632	5.4-21
78	Flint	MI	3471	6917	379	641	811	2502	473	921	18.1	1563	634	5.4-25
87	Grand Rapids	MI	3392	6777	390	688	872	2680	590	1461	22.2	1562	622	5.4-25
195	Sault Sainte Marie	MI	5087	9282	359	640	858	1399	119	246	21.0	1838	733	5.4-29
216	Traverse City	MI	3934	7654	369	642	818	2193	438	1124	21.0	1651	679	5.4-25
Minnesota														
67	Duluth	MN	5797	9918	355	633	886	1511	157	258	20.0	1882	650	5.4-29
102	International Falls	MN	6414	10535	351	669	962	1473	119	167	22.0	1870	656	5.4-29
140	Minneapolis	MN	4563	8060	380	709	972	2751	773	2509	20.7	1620	566	5.4-26
181	Rochester	MN	4544	8100	383	691	927	2360	442	590	18.8	1584	652	5.4-26
Mississippi														
103	Jackson	MS	546	2424	481	833	942	5927	2330	8789	17.2	646	640	5.4- 9
135	Meridian	MS	546	2446	480	811	905	5723	2148	9508	20.2	613	719	5.4- 9
Missouri														
51	Columbia	MO	2225	4994	431	790	972	3940	1234	4242	21.5	1189	633	5.4-23
186	Saint Louis	MO	2111	4860	432	797	983	4193	1467	5379	18.7	1124	614	5.4-23
206	Springfield	MO	1839	4509	446	812	982	4115	1311	4170	20.4	1215	544	5.4-23
Montana														
26	Billings	MT	3627	7156	380	814	1160	2544	598	2695	25.6	1650	617	5.4-25
57	Cutbank	MT	4718	8941	357	768	1150	1368	117	702	27.6	1834	672	5.4-26
65	Dillon	MT	4140	8210	386	838	1187	1564	159	784	28.6	1814	639	5.4-26
83	Glasgow	MT	5082	8828	361	752	1115	2272	543	2642	26.0	1688	570	5.4-29
88	Great Falls	MT	3728	7454	366	776	1133	2199	450	1886	26.7	1684	641	5.4-25
96	Helena	MT	3926	7817	372	771	1098	1911	328	1771	28.3	1784	651	5.4-25
118	Lewistown	MT	4027	8089	368	753	1084	1629	216	1270	29.8	1740	673	5.4-26
138	Miles City	MT	4435	7989	374	800	1156	2694	773	4364	26.9	1588	565	5.4-26
142	Missoula	MT	3492	7560	363	704	957	1629	221	1513	30.8	1843	658	5.4-25
Nebraska														
85	Grand Island	NE	3315	6477	420	843	1115	3309	996	4580	24.5	1431	611	5.4-25
155	North Platte	NE	3447	6905	419	880	1183	2731	715	3468	26.2	1514	592	5.4-27
159	Omaha	NE	2981	5968	414	806	1066	3618	1130	3883	19.6	1355	586	5.4-21
197	Scottsbluff	NE	3335	6900	413	861	1168	2603	693	3745	28.3	1457	620	5.4-27
Nevada														
72	Elko	NV	3345	7178	420	1000	1332	1997	355	4065	37.8	1540	569	5.4-27
73	Ely	NV	3683	7666	432	1014	1350	1650	157	1317	30.1	1529	683	5.4-27
116	Las Vegas	NV	449	2399	456	1136	1417	6567	3043	26408	25.5	604	719	5.4-11
125	Lovelock	NV	2438	5845	418	1094	1452	2813	745	6659	34.7	1358	606	5.4-22
178	Reno	NV	2181	5841	428	1068	1401	2180	365	4059	39.3	1306	752	5.4-22
214	Tonopah	NV	2308	5652	427	1130	1502	2742	611	3777	28.4	1257	660	5.4-22
228	Winnemucca	NV	2774	6471	418	1014	1350	2264	486	6366	41.0	1383	608	5.4-22
233	Yucca Flats	NV	1664	4802	450	1112	1399	3378	1041	11568	35.9	1004	670	5.4-16
New Hampshire														
54	Concord	NH	3742	7425	375	630	824	2254	463	1865	22.6	1533	683	5.4-25
New Jersey														
114	Lakehurst	NJ	2174	5265	407	712	917	3299	915	3019	20.5	1312	645	5.4-20
151	Newark	NJ	2027	4956	406	710	912	3556	1009	2487	17.7	1325	644	5.4-20

C.3

												NO HRS 8AM-4PM		ACP
NO	CITY	STATE	HDD50	HDD65	VSN	VSEW	VSS	CDD50	CDD65	CDH80	DR	T<55	55≤T≤69	TABLE
New Mexico														
5	Albuquerque	NM	1633	4423	469	1105	1361	3942	1257	5705	25.3	1148	703	5.4-18
49	Clayton	NM	2138	5176	457	1019	1310	3122	685	2093	20.0	1150	770	5.4-22
184	Roswell	NM	1008	3486	490	1081	1280	4536	1539	11135	26.1	825	677	5.4-18
217	Truth or Consequences	NM	1074	3592	488	1113	1326	4457	1500	6882	23.4	889	744	5.4-18
219	Tucumcari	NM	1344	3922	470	1046	1300	4451	1554	8424	26.9	914	710	5.4-18
New York														
4	Albany	NY	3488	6770	395	719	942	2812	619	1308	19.7	1487	605	5.4-25
27	Binghampton	NY	3885	7397	370	592	733	2373	410	672	18.5	1657	662	5.4-25
34	Buffalo	NY	3213	6721	371	609	746	2476	509	779	19.2	1571	697	5.4-25
131	Massena	NY	4583	8397	380	708	942	2026	365	913	20.9	1674	627	5.4-26
149	New York (Central Pk)	NY	1986	5022	392	650	817	3273	834	911	12.5	1335	790	5.4-20
150	New York (LAG)	NY	1986	5022	392	650	817	3273	834	911	12.5	1335	790	5.4-20
182	Rochester	NY	3482	6995	374	622	771	2557	595	1642	20.1	1612	608	5.4-25
210	Syracuse	NY	3448	6856	371	611	764	2579	513	926	20.2	1521	730	5.4-25
North Carolina														
13	Asheville	NC	1407	4203	449	782	946	3442	763	1298	21.1	1083	915	5.4-15
37	Cape Hatteras	NC	635	2745	460	819	972	4978	1613	2039	10.0	765	820	5.4- 7
43	Charlotte	NC	1086	3412	456	809	968	4698	1549	4299	19.6	892	777	5.4-17
45	Cherry Point	NC	569	2556	461	826	996	5277	1788	3614	15.2	690	757	5.4- 7
90	Greensboro	NC	1261	3760	449	810	994	4274	1298	3642	17.4	1018	718	5.4-17
174	Raleigh	NC	1131	3509	445	774	935	4485	1389	3697	16.5	918	740	5.4-17
North Dakota														
29	Bismarck	ND	5196	8992	371	766	1114	2175	496	2067	27.8	1724	556	5.4-29
77	Fargo	ND	5582	9242	371	751	1077	2388	573	2288	22.2	1730	546	5.4-29
141	Minot	ND	5336	9178	358	724	1059	2064	431	1570	24.5	1800	581	5.4-29
Ohio														
3	Akron	OH	2881	6172	396	664	812	2845	661	1100	17.3	1460	680	5.4-21
53	Columbus	OH	2424	5493	401	671	819	3195	789	2268	22.6	1375	708	5.4-20
59	Dayton	OH	2573	5549	408	696	855	3367	868	1346	17.1	1388	611	5.4-20
213	Toledo	OH	3132	6514	393	676	853	2791	698	1794	17.8	1500	652	5.4-21
232	Youngstown	OH	3129	6557	383	624	760	2593	546	1128	21.4	1523	679	5.4-21
Oklahoma														
157	Oklahoma City	OK	1417	3825	465	875	1053	4901	1834	8878	20.8	980	733	5.4-18
220	Tulsa	OK	1429	3732	453	820	991	5244	2072	10065	19.7	983	591	5.4-19
Oregon														
14	Astoria	OR	1080	5226	350	588	782	1357	29	145	12.3	1571	1236	5.4-14
133	Medford	OR	1531	4893	405	814	1005	2681	568	4081	32.9	1442	749	5.4-15
154	North Bend	OR	629	4678	392	740	977	1429	2	0	11.8	1351	1553	5.4- 4
170	Portland	OR	1151	4577	364	647	841	2321	272	1086	22.8	1421	1060	5.4-14
177	Redmond	OR	2535	6665	395	835	1127	1573	228	2390	34.4	1631	695	5.4-20
187	Salem	OR	1128	4926	373	680	874	1849	172	1224	29.3	1499	916	5.4-14
Pennsylvania														
6	Allentown	PA	2692	5760	401	682	864	3105	698	1146	17.0	1335	710	5.4-21
18	Avoca	PA	2931	6236	389	646	811	2823	652	1547	19.7	1505	705	5.4-21
74	Erie	PA	3006	6426	384	646	792	2527	472	378	14.8	1532	716	5.4-21
94	Harrisburg	PA	2302	5251	404	687	864	3518	992	2860	20.1	1342	648	5.4-20
162	Philadelphia	PA	2044	4923	408	701	889	3661	1065	3172	17.1	1286	646	5.4-20
165	Pittsburgh	PA	2773	5907	392	642	780	2989	648	1040	19.0	1426	700	5.4-21
Rhode Island														
172	Providence	RI	2610	6022	393	677	874	2756	693	1284	16.8	1429	684	5.4-21
South Carolina														
41	Charleston	SC	435	2194	467	796	925	5722	2005	5249	16.4	570	767	5.4- 9
52	Columbia	SC	694	2666	467	816	953	5613	2110	8541	19.5	741	705	5.4- 9
91	Greenville	SC	907	3220	459	814	971	4563	1400	3494	17.7	866	851	5.4- 7

C.4

NO CITY	STATE	HDD50	HDD65	VSN	VSEW	VSS	CDD50	CDD65	CDH80	DR	NO HRS T<55	8AM-4PM 55≤T≤69	ACP TABLE
South Dakota													
100 Huron	SD	4820	8351	390	769	1044	2718	774	3739	24.5	1630	545	5.4-26
164 Pierre	SD	4028	7358	392	822	1147	3079	934	5262	24.2	1564	557	5.4-26
175 Rapid City	SD	3672	7229	394	819	1142	2581	663	3477	28.2	1530	572	5.4-25
203 Sioux Falls	SD	4240	7683	394	778	1078	2811	779	3029	20.2	1553	599	5.4-26
Tennessee													
44 Chattanooga	TN	1232	3595	444	738	869	4652	1541	5079	17.6	1050	684	5.4-17
108 Knoxville	TN	1283	3818	446	762	898	4455	1514	3840	17.8	1076	703	5.4-17
134 Memphis	TN	1034	3259	460	806	935	5319	2069	7807	19.2	865	851	5.4-19
147 Nashville	TN	1165	3609	443	749	863	4583	1552	5078	18.2	897	749	5.4-17
Texas													
1 Abilene	TX	792	2714	494	924	1066	5968	2416	13206	21.5	760	648	5.4-10
8 Amarillo	TX	1592	4331	471	1013	1253	4113	1377	6763	23.9	1109	680	5.4-18
17 Austin	TX	271	1735	503	877	972	6873	2862	14093	19.3	564	664	5.4-10
32 Brownsville	TX	35	642	547	908	908	8531	3664	12218	14.8	191	422	5.4-12
55 Corpus Christi	TX	106	889	529	906	946	8200	3508	13109	17.2	249	543	5.4-12
61 Del Rio	TX	186	1397	511	903	1008	7376	3112	14870	19.8	474	732	5.4-10
70 El Paso	TX	522	2605	503	1133	1306	5617	2225	13224	21.3	660	735	5.4-10
81 Fort Worth	TX	605	2354	485	875	994	6174	2448	13682	20.5	673	772	5.4-10
99 Houston	TX	195	1346	490	805	883	7215	2891	10569	18.2	352	703	5.4- 9
107 Kingsville	TX	49	874	527	881	922	8302	3652	15512	19.2	260	523	5.4-12
115 Laredo	TX	65	842	532	900	936	8827	4130	25225	21.4	286	598	5.4-13
126 Lubbock	TX	1173	3643	488	1070	1267	4754	1749	9827	25.1	917	743	5.4-18
127 Lufkin	TX	370	1846	492	848	942	6667	2668	11737	21.5	478	681	5.4-10
137 Midland	TX	634	2573	504	1079	1247	5695	2159	11177	25.9	698	729	5.4-10
168 Port Arthur	TX	167	1416	497	824	900	6888	2662	8837	17.4	384	697	5.4- 9
189 San Angelo	TX	538	2110	503	944	1076	6522	2619	14621	20.6	641	619	5.4-10
190 San Antonio	TX	261	1579	510	878	955	7170	3013	13841	20.1	462	690	5.4-10
200 Sherman	TX	699	2708	476	862	996	5844	2378	12065	20.2	785	721	5.4-10
221 Waco	TX	488	2166	495	874	972	6676	2879	15658	21.1	651	622	5.4-10
226 Wichita Falls	TX	984	3049	480	911	1077	5708	2299	14487	18.8	802	723	5.4-10
Utah													
33 Bryce Canyon	UT	4709	9288	445	1063	1386	899	4	69	30.0	1660	841	5.4-28
40 Cedar City	UT	2592	5888	447	1054	1342	2802	624	3119	27.1	1392	629	5.4-22
188 Salt Lake City	UT	2570	5975	422	975	1266	3011	941	7030	29.1	1426	586	5.4-22
Vermont													
36 Burlington	VT	4211	7932	382	698	925	2118	365	490	18.3	1697	637	5.4-26
Virginia													
153 Norfolk	VA	1185	3609	443	792	964	4636	1586	4554	15.0	1014	685	5.4-17
179 Richmond	VA	1322	3895	430	745	923	4225	1323	4021	17.6	996	716	5.4-17
180 Roanoke	VA	1520	4192	433	763	946	3986	1183	3306	19.0	1148	713	5.4-17
Washington													
158 Olympia	WA	1546	5550	351	619	819	1550	79	466	26.4	1577	985	5.4-14
198 Seattle/Tacoma	WA	1382	5281	350	621	828	1683	106	256	16.5	1700	982	5.4-14
205 Spokane	WA	2983	6727	363	758	1064	2094	363	1595	25.3	1669	640	5.4-21
225 Whidbey Island	WA	1179	5274	344	630	878	1403	22	7	14.8	1671	1169	5.4-14
230 Yakima	WA	2323	5877	373	790	1091	2370	449	3285	31.2	1413	703	5.4-20
West Virginia													
42 Charleston	WV	1816	4587	409	667	798	3712	1008	3054	20.8	1215	704	5.4-20
Wisconsin													
69 Eau Claire	WI	4751	8285	376	683	923	2545	603	1898	18.2	1565	661	5.4-26
89 Greenbay	WI	4310	8039	380	696	947	2172	426	957	22.1	1604	651	5.4-26
112 La Crosse	WI	3838	7243	386	701	937	2786	716	2121	18.9	1568	644	5.4-25
129 Madison	WI	4009	7466	391	717	955	2559	542	1329	19.1	1511	658	5.4-26
139 Milwaukee	WI	3586	7121	396	724	941	2427	487	1013	17.1	1587	618	5.4-25

C.5

NO	CITY	STATE	HDD50	HDD65	VSN	VSEW	VSS	CDD50	CDD65	CDH80	DR	NO HRS T<55	8AM-4PM 55≤T≤69	ACP TABLE
Wyoming														
39	Casper	WY	3824	7617	403	961	1343	2177	495	2699	29.8	1670	535	5.4-27
46	Cheyenne	WY	3435	7218	416	906	1267	1963	271	1040	26.4	1618	608	5.4-27
183	Rock Springs	WY	4407	8391	411	1012	1395	1698	207	702	29.1	1828	552	5.4-28
199	Sheridan	WY	3605	7366	387	806	1133	2074	360	2105	30.8	1650	574	5.4-25
Other Locations Outside U.S.A.														
92	Guantanamo Bay	CU	0	0	612	1045	1018	11071	5596	18452	15.5	0	17	5.4- 3
110	Koror Island	PN	0	0	662	890	827	11435	5960	14548	9.5	0	0	5.4- 3
111	Kwajalein Island	PN	0	0	678	961	888	11635	6160	16217	8.2	0	0	5.4- 3
193	San Juan	PR	0	0	608	963	931	10648	5173	11563	12.7	0	14	5.4- 3
222	Wake Island	PN	0	0	609	1002	977	10869	5394	10167	9.7	0	0	5.4- 3

C.6

ATTACHMENT 5B TO SECTION 435.105
EQUATIONS TO DETERMINE EXTERNAL WALL HEATING AND COOLING CRITERIA
AND
TO DETERMINE COMPLIANCE WITH THE CRITERIA

5B.1 Equations and Coefficients

This attachment contains the external wall equations for use in determining external wall heating and cooling criteria (WC_h and WC_c) and for determining compliance (H_i and C_i) with the criteria for north, east, south and west orientations. For NE, NW, SW and SE orientations, WC_h, WC_c, H_i and C_i shall be determined by treating half of each wall area as though it faces each of the adjacent cardinal directions, e.g., treat NE as half north and half east.

Equations 5.5-2 and 5.5-6 are statistical regression equations that correlate envelope cooling and heating loads, respectively, from thermal transmission and solar gains, as modified by internal gain and mass, to the physical components of the envelope. Seven individual terms are identified for both cooling and heating that correlate variables with physical meaning such as U-values, internal gains, and weather related variables. They are as follows:

1. CLU, CLUO, CLXUO: Terms that correlate cumulative annual cooling loads with thermal transmittance of the wall.
2. CLM: Term that correlates cumulative annual cooling loads with heat capacity of the wall.
3. CLG: Term that correlates cumulative annual cooling loads with internal gains from occupant light and equipment.
4. CLS: Term that correlates cumulative annual cooling loads with incident solar gains.
5. CLC: Term that correlates cumulative annual cooling loads with climate variables for a specific location.
6. HLU, HLUO, HLXUO: Terms that correlate cumulative annual heating loads with thermal transmittance of the wall.
7. HLM: Term that correlates cumulative annual heating loads with heat capacity of the wall.
8. HLG: Term that correlates cumulative annual heating loads with internal gains from occupants, lights, and equipment.
9. HLS: Term that correlates cumulative annual heating loads with incident solar gains.

10. HLC: Term that correlates cumulative annual heating loads with climate variables for a specific location.

The cooling and heating equations with their coefficients follow.

Cooling Equation

$$WC_c \text{ or } C_1 = CLU_i + CLUO_i + CLXUO_i + CLM_i + CLG_i + CLS_i + CLC_i$$

Equation 5.5-2

Where:

i = for each orientation

j = for each wall mass construction type for the orientation

$$
\begin{aligned}
CLU &= FO \times U_{ow} \times [\, CU1 \times CDH80 \\
&\quad + CU2 \times CDH80^2 \\
&\quad + CU3 \times (VS \times CDH80)^2 \\
&\quad + CU4 \times DR \,]
\end{aligned}
$$

$$
\begin{aligned}
CLUO &= FC \times UOC \times [\, CUO1 \times EA \times VS \times CDD50 \\
&\quad + CUO2 \times G \\
&\quad + CUO3 \times G^2 \times EA^2 \times VS \times CDD50 \\
&\quad + CUO4 \times G^2 \times EA^2 \times VS \times CDD65 \,]
\end{aligned}
$$

$$
\begin{aligned}
CLXUO &= FC \times 1/UOC \times [\, CXUO1 \times EA \times VS \times CDD50 \\
&\quad + CXUO2 \times EA \times (VS \times CDD50)^2 \\
&\quad + CXUO3 \times G \times CDD50 \\
&\quad + CXUO4 \times G^2 \times EA^2 \times VS \times CDD50 \\
&\quad + CXUO5 \times G^2 \times CDD65 \,]
\end{aligned}
$$

$$
\begin{aligned}
CLM &= FO_j \times CMC_i \times [\, CM1 + CM2 \times EA \times VS \times CDD50 \\
&\quad + CM3 \times EA \times VS \times CDD65 \\
&\quad + CM4 \times EA^2 \times VS \times CDD50 \\
&\quad + CM5 \times G^2 \times CDD65 \\
&\quad + CM6 \times G \times CDD50 \\
&\quad + CM7 \times G \times CDD65 \\
&\quad + CM8 \times G \times EA \times VS \times CDD50 \,]
\end{aligned}
$$

$$
\begin{aligned}
CLG &= FC \times \{\, G \times [\, CG1 + CG2 \times CDD50 \\
&\quad + CG3 \times EA \times (VS \times CDD50)^2 \\
&\quad + CG4 \times EA^2 \times VS \times CDD50 \\
&\quad + CG5 \times CDD65 \\
&\quad + CG6 \times CDD50^3 \\
&\quad + CG7 \times CDD65^3 \,] \\
&\quad + G^2 \times [\, CG8 \times EA \times VS \times CDD50 \\
&\quad + CG9 \times EA^2 \times VS \times CDD50 \,] \,\}
\end{aligned}
$$

$$CLS = FC \times (EA \times [CS1 + CS2 \times VS \times CDD50 + CS3 \times (VS \times CDD50)^2 + CS4 \times VS \times CDD65 + CS5 \times (VS \times CDD65)^2] + EA^2 \times [CS6 + CS7 \times (VS \times CDD65)^2])$$

$$CLC = FC \times [CC1 \times CDD50 + CC2 \times CDD50^2 + CC3 \times CDH80 + CC4 \times CDH80^2 + CC5 \times CDD65 + CC6 \times (VS \times CDD65)^2 + CC7 \times VS \times CDD50 + CC8 \times (VS \times CDD50)^2 + CC9 \times (VS \times CDH80)^2 + CC10 \times VS + CC11 \times DR + CC12 \times DR^2 + CC13]$$

NOTE: The coefficients for various orientations in the equations listed above are found in Table 5B-2. If WC_c or C_1 is less than 0.0, WC_c or C_1 is set equal to 0.0.

Where:

Climate Data

CDD50 = Cooling degree-days base 50 °F

CDD65 = Cooling degree-days base 65 °F

CDH80 = Cooling degree-hours base 80 °F

DR = Average daily temperature range for warmest month.

VS = Annual average daily incident solar energy on facade under consideration, Btu/ft^2/day.

Building Data

FC = Wall area (opaque and glazed) of zone under consideration divided by total wall area (opaque and glazed) of all zones.

FO = Opaque wall area of zone under consideration divided by total wall area (opaque and glazed) of all zones. If multiple mass constructions are present, the FO_j is calculated for each construction j and used to form the area weighted mass correction.

U_{ow} = Area average U-value of opaque walls (including those of mass construction) in zone under consideration.

UOC = Area average U-value of wall (opaque and glazed, evaluated under cooling conditions) in zone under consideration. UOC is equal to UOH.

WWR = Window wall ratio for zone under consideration; defined as fenestration area divided by total wall area (opaque and glazed).

EA = Effective aperature fraction for zone under consideration, where:

$$EA = WWR \times SC_x \times S_{ec}$$

Equation 5.5-3

Where:

S_{ec} = The cooling adjustment factor for horizontal external shading projections:

For $0.0 \leq PF \leq 0.5$ from Equation 5.4-1

For the north orientation:

$$S_{ec} = 1 - 0.4 \times PF$$

Equation 5.5-3a

For the east, south and west orientations:

$$S_{ec} = 1.0 - 1.4877 \times PF + 1.0489 \times PF^2$$

Equation 5.5-3b

G = Effective internal gain (W/ft^2) for zone under consideration, where:

$$G = E_p + L_p \times (1 - R_c \times K_d) + O_l$$

Equation 5.5-4

Where:

L_p = Lighting power, from Section 5.5.7.4

E_p = Equipment power, from Section 5.5.7.5

R_c = The ratio of the electric lights in the same space served by the orientation that have automatic controls for daylighting.

O_l = Occupant load adjustment, from Section 5.5.7.6

$$K_d = 5.871 \, (WWR \times VLT \times S_{ec}) - 13.311 \, (WWR \times VLT \times S_{ec})^2$$

Equation 5.5-4a

If (WWR x VLT x S_{ec}) > 0.22, then K_d = 0.647

Where:

WWR = As defined above, but not to exceed a maximum value of 0.65 in Equation 5.5-4a, per Section 5.5.7.3.

VLT = Visible light transmittance of the glazing material, as defined in Section 5.5.2.1, including any shading devices present that modify the visible transmittance of the glazing material.

CMC = Mass correction (Cooling Delta Load Factor) from Equation 5.5-5. If multiple mass constructions are present, each CMC_j is evaluated separately and combined by area weighting. If the U-value of the mass wall is less than 0.05, then U_{ow} = 0.05 shall be used to calculate the CMC. If the value of HC is greater than 20, then HC = 20 shall be used to calculate the CMC.

COOLING DELTA LOAD FACTOR EQUATIONS

Equation 5.5-5 is used to predict the Cooling Delta Load Factor values.

CMC = Cooling Delta Load Factor =

$$\left| 1 - e^{-CP_1(HC-1)} \right| \left| CP_2 + CP_3U - \frac{CP_4}{1 + (CP_5 + CP_6U)e^{-(CP_7 + CP_8U^2)(HC-1)}} \right| \left| \frac{1.0}{0.7} \right|$$

Equation 5.5-5

Where:

HC = Wall Heat Capacity (Btu/ft$^{2 \cdot o}$F).

U = Wall U-Value (Btu/h/ft$^{2 \cdot o}$F).

A = (Cooling degree-hours base 80 ^{o}F)/10000 + 2 (^{o}F·h).

B = (Daily Range)/10 + (^{o}F).

Where:

$CP_1 = C_5$

$CP_2 = C_{15}/B^3 + C_{16}/(A^2B^2)+C_{17}$

$CP_3 = C_1/A^3 + C_2B^3 + C_2B^3 + C^3/(A^2 \sqrt{B}) + C_4$

$CP_4 = C_{12}/(A^2B^2) + C_{13}/B^3 + C_{14}$

$CP_5 = C_{18}$

$CP_6 = C_6 LN(A) \sqrt{B} + C_7$

LN = Natural Logarithm

$CP_7 = C_{19}/(A^2B^2) + C_{20}/(AB) + C_{21}A^2/ \sqrt{B} + C_{22}$

$CP_8 = C_8/(A^2B^2) + C_9/(AB) + C_{10}A^2/ \sqrt{B} + C_{11}$

The coefficients C1 through C22 are taken from the following table, Table 5B-1.

HEATING EQUATION

$$WC_h \text{ or } H_1 = \Sigma (HLU_i + HLUO_i + HLXUO_i + HLM_i + HLG_i + HLS_i + HLC_i)$$

Equation 5.5-6

Where:

i = for each orientation

j = for each wall mass construction type for the orientation

$HLU = FO \times U_{ow} \times [HU1 \times HDD50 + HU2 \times (VS \times HDD65)^2]$

$HLUO = FC \times UOH \times [HUO1 \times HDD50 + HUO2 \times HDD65 + HUO3 \times EA \times VS \times HDD65]$

$HLXUO = FC \times ((1/UOH) \times [HXUO1 \times EA \times (VS \times HDD50)^2 + HXUO2 \times EA \times (VS \times HDD65)^2] + (1/UOH^2) \times [HXUO3 \times EA^2 \times VS \times HDD65])$

$HLM = FO_j \times HMC_j \times [HM1 + HM2 \times G \times UOH \times HDD65 + HM3 \times G^2 \times EA^2 \times VS \times HDD50 + HM4 \times UOH \times EA \times VS \times HDD65 + HM5 \times UOH \times HDD50 + HM6 \times EA \times (VS \times HDD65)^2 + HM7 \times EA^2 \times VS \times HDD65/UOH]$

$$HLG = FC \times \{ G \times [HG1 \times HDD65 + HG2 \times UOH \times HDD65 + HG3 \times EA \times VS \times HDD65 + HG4 \times EA^2 \times VS \times HDD50] \times G^2 \times [HG5 \times HDD65 + HG6 \times EA^2 \times VS \times HDD65] \}$$

$$HLS = FC \times \{ EA \times [HS1 \times VS \times HDD65 + HS2 \times (VS \times HDD50)^2] + EA^2 \times [HS3 \times VS \times HDD50 + HS4 \times VS \times HDD65] \}$$

$$HLC = FC \times [HC1 + HC2 \times HDD65 + HC3 \times HDD65^2 + HC4 \times VS^2 + HC5 \times VS \times HDD50 + HC6 \times VS \times HDD65 + HC7 \times (VS \times HDD50)^2]$$

NOTE: The coefficients for various orientations in the equations listed above are found in Table 5B-4. If WC_h or H_1 is less than 0.0, WC_h or H_1 is set equal to 0.0.

Where:

Climate Data

HDD50 = Heating degree-days base 50 °F.

HDD65 = Heating degree-days base 65 °F.

VS = Annual average daily incident solar energy on facade under consideration, Btu/ft^2-day.

Building Data

FC = Wall area (opaque and glazed) of zone under consideration divided by total wall area (opaque and glazed) of all zones.

FO = Opaque wall area of zone under consideration divided by total wall area (opaque and glazed) of all zones. If multiple mass constructions are present, the FO_j is calculated for each and used to form the area weighted mass correction.

U_{ow} = Area average U-value of opaque walls (including those of mass construction) in zone under consideration.

UOH = Area average U-value of wall (opaque and glazed, evaluated under heating conditions) in zone under consideration. UOH is equal to UOC.

WWR = Window wall ratio for zone under consideration; defined as fenestration area divided by total wall area (opaque and glazed).

EA = Effective aperature fraction for zone under consideration.

$$EA = WWR \times SC_x \times S_{eh}$$

Equation 5.5-7

Where:

For $0.0 \leq PF \leq 0.5$, from Equation 5.4-1:

For the north orientation:

$$S_{eh} = 1 - 0.3 \times PF$$

Equation 5.5-7a

For the east, south and west orientation:

$$S_{eh} = 1 - 0.986 \times PF + 0.4513 \times PF^2$$

Equation 5.5-8

G = Effective internal gain (W/ft^2) for zone under consideration.

$$G = E_p + L_p \times (1 - R_c \times K_d) + O_l$$

Equation 5.5-8

Where:

L_p = Lighting power, from Section 5.5.7.4.

E_p = Equipment power, from Section 5.5.7.5.

O_l = Occupant load adjustment, from Section 5.5.7.6

R_c = The ratio of the electric lights in the space served by the orientation that have automatic controls for daylighting.

$$K_d = 5.871 \, (WWR \times VLT \times S_{eh}) - 13.311 \, (WWR \times VLT \times S_{eh})^2$$

Equation 5.5-8a

If WWR x VLT x S_{eh} > 0.22, then K_d = 0.647

Where:

WWR = As defined above, but not to exceed a maximum value of 0.65 in Equation 5.5-8a per Section 5.5.7.3.

VLT = Visible light transmittance of the glazing material, as defined in Section 5.5.2.1 including any shading devices present that modify the visible transmittance of the glazing material.

HMC = Mass correction from Equation 5.5-9. If multiple mass constructions are present, each HMC_j is evaluated separately and combined by area weighting. If the U-value of the mass wall is greater than 0.40, then U_{ow} = 0.4 shall be used to calculate the HMC. If the U-value of the mass wall is less than 0.05, then U_{ow} = 0.05 shall be used to calculate the HMC. If the value of HC is greater than 20, then HC = 20 shall be used to calculate the HMC.

HEATING DELTA LOAD FACTOR EQUATIONS

Equation 5.5-9 is used to predict the heating Delta Load Factor values.

HMC = Heating Delta Load Factor =

$$\left|1 - e^{-HP_1(HC-1)}\right| \left| HP_2 + HP_3U - \frac{HP_4}{1 + (HP_5 + HP_6U)e^{-(HP_7+HP_8U^2)(HC-1)}}\right| \frac{1.0}{0.7}$$

Equation 5.5-9

Where:

HC = Wall Heat Capacity (Btu/ft$^{2}\cdot{}^{o}$F)

U = Wall U-Value (Btu/h·ft$^{2}\cdot{}^{o}$F)

A = (Heating degree-days base 65 ^{o}F/100 + 2 (^{o}F·days)

Where:

$HP_1 = H_6$

$HP_2 = H_{14}LN(A)+H_{15}$

LN = Natural Logarithm

$HP_3 = H_1A^3+H_2A^2+H_3/\sqrt{A} + H_4\sqrt{A} + H_5$

$HP4 = H_{11}A^2+H_{12}/A^2+H_{13}$

$HP_5 = H_{16}$

$HP_6 = H_7A+H_8$

$HP_7 = H_{17}/A^3+H_{18}$

$HP_8 = H_9/A^3+H_{10}$

The coefficients H1 through H18 are taken from the following table, Table 5B-3.

5B.2 Determining Heating and Cooling Criteria Using Equations in Section 5B.1

To determine the wall thermal criteria for a building design, the following inputs to the equations in Section 5B.1 shall be used.

(1) **Aspect Ratio.** An aspect ratio of 2:1 with longer dimensions facing east and west.

(2) **Shading.** No use of external shading projections or screens.

(3) **Daylight Controls.** No use of automatic daylight controls for the lighting system.

(4) **Internal Gain (G).** The sum of the lighting power density (L_p), the equipment power density (E_p) and the occupant load adjustment (O_l), or 3.0 W/ft^2, whichever is smaller, shall be used. In determining L_p, the value of R_c and VLT shall be set equal to 0.0 in Equations 5.5-4 and 5.5-8.

(5) **Wall Area Factor, Opaque and Glazed (FC).** The combined opaque and glazed area for the orientation for the building design, divided by the total wall area (opaque and glazed) of all orientations, shall be used. Note that if one changes the wall area or floor area in a zone, this changes the geometry of the building. The criteria and compliance values will change for all zones because both values for each zone are weighted by the relative size of that zone.

(6) **Window Wall Ratio (WWR).** The smaller of the values of WWR_c and WWR_h determined from (a) and (b) below shall be used.

(a) Using the value for internal gain (G) determined in (4) above, the WWR_c for cooling by interpolation of the results of (a) and (b) below, shall be determined using Equation 5.5-10:

Where: WWR_{g0} is the window to wall ratio at 0.0 W/ft^2 internal load ($G = 0.0\ W/ft^2$).

WWR_{g30} is the window to wall ratio at 3.0 W/ft^2 internal load ($G = 3.0\ W/ft^2$).

$$WWR_c = WWR_{g0} - (G / 3.0) \times (WWR_{g0} - WWR_{g30})$$

Equation 5.5-10

For G = 0.0:

If CDD50 x VSEW < 8,000,000, then Equation 5.5-11 shall be used.

$$WWR_{g0} = 0.48 - (CDD50 \times VSEW \times 1.625 \times 10^{-8})$$

Equation 5.5-11

If CDD50 x VSEW ≥ 8,000,000, then Equation 5.5-12 be used:

$$WWR_{g0} = 0.34$$

Equation 5.5-12

For G = 3.0:

If CDD50 x VSEW < 8,000,000, then Equation 5.5-13 shall be used:

$$WWR_{g30} = 0.28 - (CDD50 \times VSEW \times 5.0 \times 10^{-9})$$

Equation 5.5-13

If CDD50 x VSEW $\geq$ 8,000,000, then Equation 5.5-14 shall be used:

$$WWR_{g30} = 0.24$$

Equation 5.5-14

(b) The WWR_h for heating shall be determined using Equation 5.5-15 or Equation 5.5-16.

If HDD65 < 4000, then Equation 5.5-15 shall be used:

$$WRR_h = 0.4 - (HDD65 \times 2.5 \times 10^{-5})$$

Equation 5.5-15

If HDD65 $\geq$ 4000, then Equation 5.5-16 shall be used:

$$WRR_h = 0.3$$

Equation 5.5 16

(7) **Opaque Wall Area Factor (FO).** The value of FO shall be determined from Equation 5.5-17.

$$FO = FC \times (1 - WWR)$$

Equation 5.5-17

(8) **Shading Coefficient (SC_x).** The value of SC_x shall be determined from (a) or (b) below, or as shown in Figure 5B-3.

(a) If the heating degree-days base 65 °F for the building location is $\leq$ to 3000, either Equation 5.5-18 or Equation 5.5-19 shall be used:

If CDD50 x VSEW < 4,000,000, then Equation 5.5-18 shall be used:

$$SC_x = 0.85 - (CDD50 \times VSEW \times 8.75 \times 10^{-8})$$

Equation 5.5-18

If CDD50 x VSEW $\geq$ 4,000,000, then Equation 5.5-19 shall be used:

$$SC_x = 0.5$$

Equation 5.5-19

(b) If the heating degree days base 65 °F for the building location is > 3000, either Equation 5.5-20 or Equation 5.5-21 shall be used:

If CDD50 x VSEW < 4,000,000, then Equation 5.5-20 shall be used:

$$SC_x = 0.85 - (CDD50 \times VSEW \times 1.25 \times 10^{-7})$$

Equation 5.5-20

If CDD50 x VSEW $\geq$ 4,000,000, then Equation 5.5-21 shall be used:

$$SC_x = 0.35$$

Equation 5.5-21

(9) **External Shading Projection (S_{eh}).** The value of S_{eh} shall be set equal to 0.0.

(10) **Opaque Wall U-Value (U_{ow}).** The value of U_{ow} shall be determined from either Equation 5.5-22 or Equation 5.5-23, as shown in Figure 5B-4.

If HDD65 < 196, then Equation 5.5-22 shall be used:

$$U_{ow} = 1.0$$

Equation 5.5-22

If HDD65 $\geq$ 196, then Equation 5.5-23 shall be used:

$$U_{ow} = 42.787 \times HDD65^{(-0.712)}$$

Equation 5.5-23

(11) **Heat Capacity of Opaque Wall (HC).** The value of HC shall be set equal to 1.0.

(12) **Fenestration Assembly U-Value (U_{of}).** The value of U_{of} shall be determined from either Equation 5.5-24, 5.5-25, or 5.5-26; or as shown in Figure 5B-5.

If HDD65 < 3000, then Equation 5.5-24 shall be used:

$$U_{of} = 1.15$$

Equation 5.5-24

If HDD $\geq$ 3000 and HDD65 < 7500, then Equation 5.5-25 shall be used:

$$U_{of} = 0.81 - [(HDD65 - 3000) \times 8.0 \times 10^{-5}]$$

If HDD $\geq$ 7500, then Equation 5.5-26 shall be used:

$$U_{of} = 0.45$$

Equation 5.5-26

(13) For all other inputs to the equations in Section 5B.1, the values for the building envelope design under consideration shall be used.

Table 5B-1
COOLING DELTA LOAD COEFFICIENTS

COEFFICIENT LABEL	INSULATION POSITION		
	EXTERIOR	INTEGRAL	INTERIOR
C1	220.724503	139.105667	181.616776
C2	-.056589	-.033991	-.055196
C3	-118.835388	-10.326704	-34.158966
C4	-13.674420	-20.867386	-25.591934
C5	.236381	.283882	.081029
C6	.959588	.305851	1.418998
C7	-.255004	.022622	.432421
C8	-905.677979	-307.943848	-1882.926758
C9	425.191895	80.209610	443.195801
C10	-2.510600	.049955	.430200
C11	-43.387955	-5.989545	-28.285065
C12	-259.723389	-11.396114	-63.562256
C13	-33.975525	.366851	20.844650
C14	20.488235	30.253494	9.817521
C15	-26.209152	8.833706	24.459824
C16	-241.173386	-22.254623	-70.337494
C17	18.897781	29.329697	9.884280
C18	-.353790	-.023878	-.114646
C19	156.305634	63.322754	326.344727
C20	-74.098999	-16.334656	-77.635498
C21	.445363	-.011114	-.074788
C22	7.496696	1.295576	5.204088

TABLE 5B-2

COOLING COEFFICIENTS

	NORTH	EAST	SOUTH	WEST
CU1	0.001539	0.003315	0.003153	0.00321
CU2	-0.308548E-07	-0.896618E-07	-0.712993E-07	-0.810530E-07
CU3	0.799493E-13	0.379280E-13	0.183083E-13	0.339810E-13
CU4	-0.079647	0.163114	0.286458	0.11178
CM1	0.32314	0.515262	0.71477	0.752643
CM2	0.153060E-05	0.138197E-05	0.161630E-05	0.142228E-05
CM3	-0.204322E-05	-0.160240E-05	-0.211063E-05	-0.197938E-05
CM4	-0.753665E-06	-0.767849E-06	-0.664430E-06	-0.740067E-06
CM5	-0.100472E-05	0	0.801057E-05	0.315193E-05
CM6	0.366708E-04	0.356503E-04	0.448106E-04	0.296012E-04
CM7	-0.673045E-04	-0.640938E-04	-0.000119	-0.766719E-04
CM8	-0.238335E-07	-0.472534E-07	-0.497469E-07	0
CUO1	-0.651094E-05	-0.838669E-05	-0.888996E-05	-0.756465E-05
CUO2	-1.040207	-1.507235	-1.512625	-1.238545
CUO3	-0.438254E-05	-0.278828E-05	-0.231352E-05	-0.412567E-05
CUO4	0.126580E-04	0.809874E-05	0.736219E-05	0.106712E-04
CXUO1	0.103744E-05	0.119338E-05	0.118588E-05	0.123251E-05
CXUO2	-0.132180E-12	-0.134656E-12	-0.116252E-12	-0.130002E-12
CXUO3	0.275554E-04	0.202621E-04	0.202365E-04	0.236964E-04
CXUO4	0.974090E-07	0.117514E-06	0.939207E-07	0.136276E-06
CXUO5	-0.118247E-04	-0.909694E-05	-0.909192E-05	-0.111077E-04
CG1	0.891286	0.583388	0.393756	0.948654
CG2	0.001479	0.001931	0.002081	0.001662
CG3	-0.552042E-12	-0.282139E-12	-0.284766E-12	-0.455720E-12
CG4	0.252311E-05	0.370821E-05	0.430536E-05	0.591511E-05
CG5	-0.001151	-0.001745	-0.001864	-0.00153
CG6	0.195243E-11	0	-0.296055E-11	0.316358E-11
CG7	-0.835805E-11	0.101089E-10	0.330027E-10	0
CG8	0.141022E-05	0.753875E-06	0.713300E-06	0.970752E-06
CG9	-0.238887E-05	-0.164961E-05	-0.163927E-05	-0.197363E-05
CS1	46.9871	33.9683	18.32016	29.3089
CS2	0.348091E-04	0.374118E-04	0.340490E-04	0.502498E-04
CS3	0	0	0.271313E-11	0
CS4	-0.166409E-04	0.694779E-05	-0.282181E-04	-0.277158E-04
CS5	0.842765E-11	0	-0.304677E-11	0.291137E-11
CS6	-56.5446	0	26.9954	14.9771
CS7	-0.134764E-10	-0.588097E-11	-0.650089E-11	-0.789218E-11

TABLE 5B-2 (Continued)
COOLING COEFFICIENTS

	NORTH	EAST	SOUTH	WEST
CC1	0.002747	0	0.010349	0.001865
CC2	0	0.318928E-06	-0.304413E-06	0
CC3	-0.000348	0.000319	0.00024	0.000565
CC4	0.122123E-07	-0.775318E-07	-0.271443E-07	-0.544380E-07
CC5	0.012112	0.011894	0.013248	0.009236
CC6	0.104027E-11	-0.622661E-12	-0.205178E-11	0
CC7	-0.124013E-04	-0.706280E-05	-0.165377E-04	-0.602685E-05
CC8	0	0	0.820869E-12	0
CC9	-0.375797E-13	0.606235E-13	0.197598E-13	0.389425E-13
CC10	0.030056	0.023121	0.0265	0.01704
CC11	0	0	-0.271026	-0.244274
CC12	0.002138	0.001103	0.006368	0.007323
CC13	-12.8674	-13.16522	-18.271	-10.1285

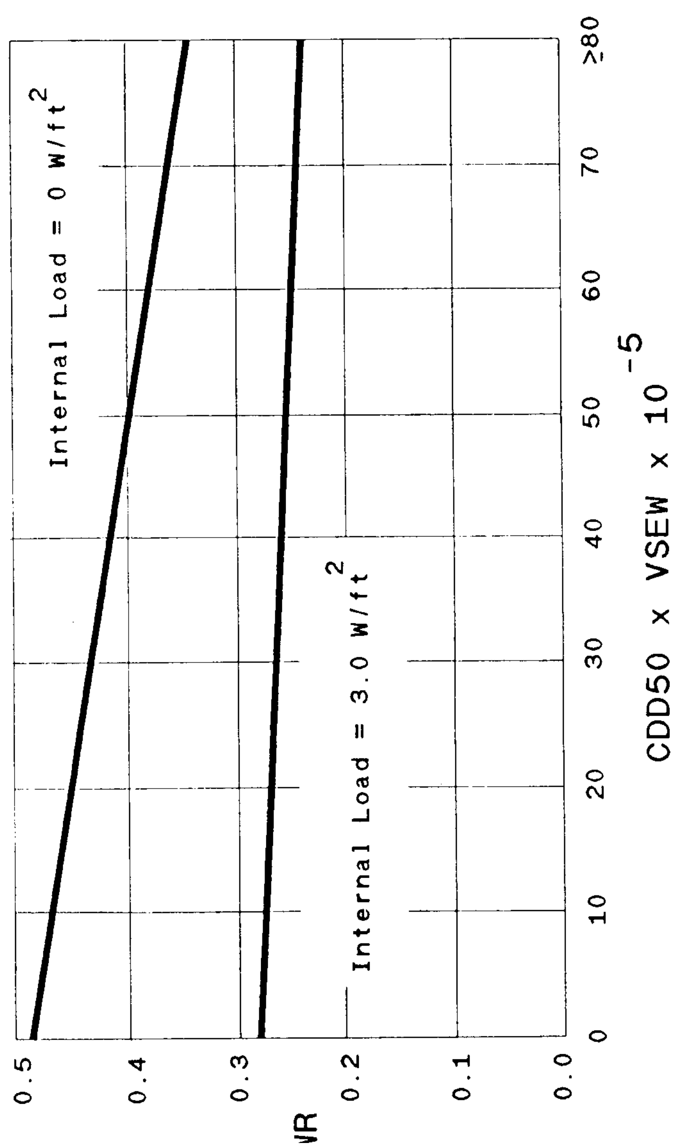
Table 5B-3
HEATING DELTA LOAD COEFFICIENTS

COEFFICIENT LABEL	INSULATION POSITION		
	EXTERIOR	INTEGRAL	INTERIOR
H1	.000006	.000007	.000006
H2	-.001537	-.001799	-.001492
H3	13.388575	15.116148	19.831360
H4	1.933217	2.105596	1.457923
H5	-11.896660	-13.305299	-15.562034
H6	.464317	.183966	.071887
H7	.009447	.025504	.026392
H8	-.099954	.045871	.775432
H9	-1223.396240	-622.080078	.200792
H10	-.945353	-.519158	-.637875
H11	-.000067	-.000069	-.000007
H12	3.858493	4.137914	2.424339
H13	7.582887	6.238024	7.980392
H14	-.777369	-.771123	-.169907
H15	9.014718	7.722863	8.585447
H16	.200680	.208271	-.038589
H17	206.638214	105.984894	3.139744
H18	.257293	.198297	.186262

Table 5B-4
HEATING COEFFICIENTS

	NORTH	EAST	SOUTH	WEST
HU1	0.006203	0.007691	0.006044	0.006672
HU2	-0.135868E-11	-0.571616E-12	-0.268998E-12	-0.435663E-12
HM1	0.531005	0.545732	0.837901	0.616936
HM2	0.000152	0.000107	0.000208	0.00015
HM3	-0.531826E-06	-0.106191E-06	-0.682531E-06	-0.264566E-06
HM4	-0.773813E-06	-0.147870E-05	0.211938E-05	-0.457827E-06
HM5	-0.000712	-0.000484	-0.001042	-0.000625
HM6	0.334859E-12	0.495762E-13	0.770190E-13	0.737105E-13
HM7	0.239071E-06	0.275045E-06	-0.389887E-06	0
HUO1	0.004943	0.008683	0.009028	0.008566
HUO2	0.013686	0.011055	0.010156	0.01146
HUO3	-0.110178E-04	-0.868956E-05	-0.732317E-05	-0.898665E-05
HXUO1	0.126940E-11	0.785644E-13	-0.282023E-12	0.304904E-13
HXUO2	-0.730582E-12	-0.810900E-13	0.745599E-13	-0.747184E-13
HXUO3	0.197090E-06	0.194026E-06	0.987587E-07	0.195776E-06
HG1	-0.001051	-0.000983	-0.000981	-0.000948
HG2	-0.001063	-0.00093	-0.000815	-0.000975
HG3	0.299013E-05	0.262269E-05	0.241880E-05	0.249976E-05
HG4	0.749049E-06	-0.111056E-05	-0.216687E-05	-0.856049E-06
HG5	0.000109	0.934310E-04	0.975523E-04	0.862389E-04
HG6	-0.555914E-06	-0.315801E-06	-0.260999E-06	-0.291334E-06
HS1	-0.218248E-04	-0.209216E-04	-0.210885E-04	-0.202049E-04
HS2	0.339179E-11	0.190500E-11	0.148388E-11	0.218215E-11
HS3	-0.653253E-05	-0.223413E-04	-0.184726E-04	-0.240488E-04
HS4	0.223087E-04	0.241331E-04	0.245412E-04	0.230538E-04
HC1	-0.106468	-5.19297	-3.66743	-5.29681
HC2	0.00729	0.007684	0.007175	0.007672
HC3	-0.297600E-06	-0.307837E-06	-0.264192E-06	-0.307127E-06
HC4	0.201569E-05	0.630350E-05	0.332112E-05	0.643491E-05
HC5	0.129061E-04	0.477552E-05	0.325089E-05	0.483233E-05
HC6	-0.128594E-04	-0.618539E-05	-0.463086E-05	-0.625101E-05
HC7	0.275861E-11	0.820051E-12	0.438148E-12	0.809106E-12

Figure 5B–1
Maximum Window to Wall Ratio
Cooling



Note: use linear interpolation for internal loads 0 < W/ft^2 < 3.0

Figure 5B-2
Maximum Window to Wall Ratio
Heating

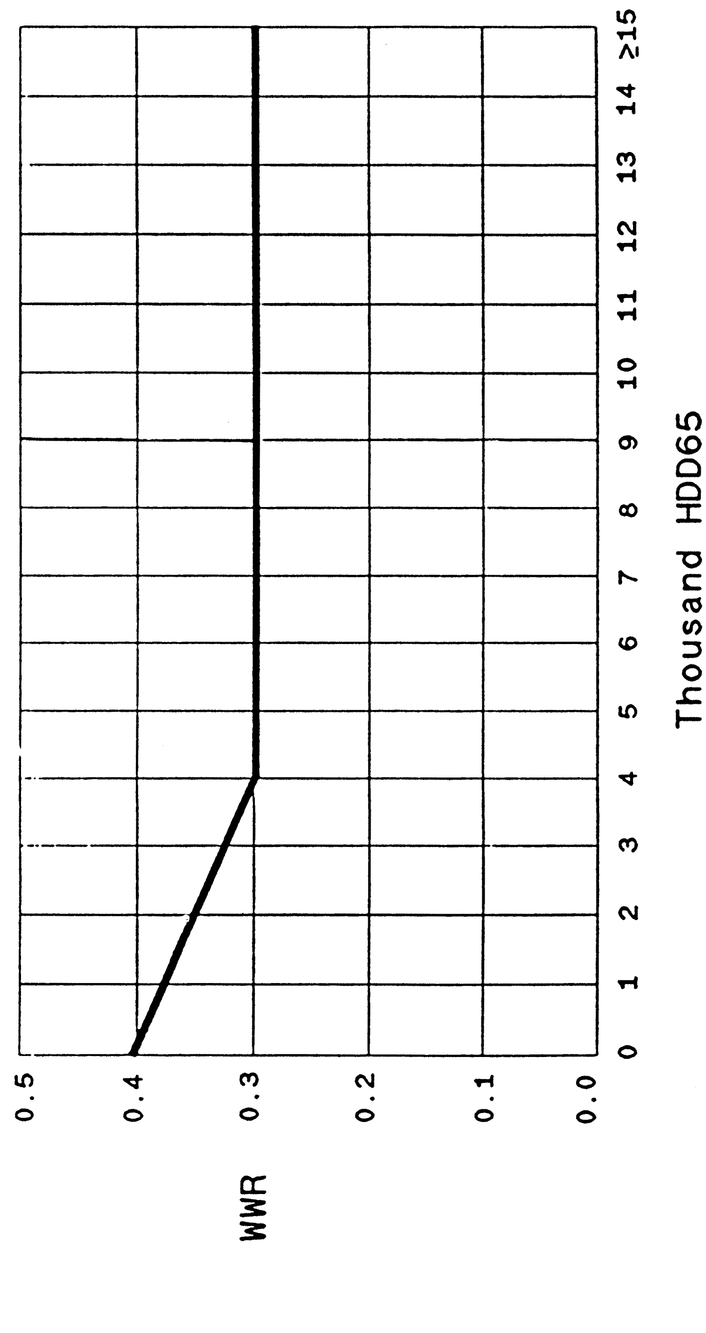


Figure 5B-3

Maximum Shading Coefficient

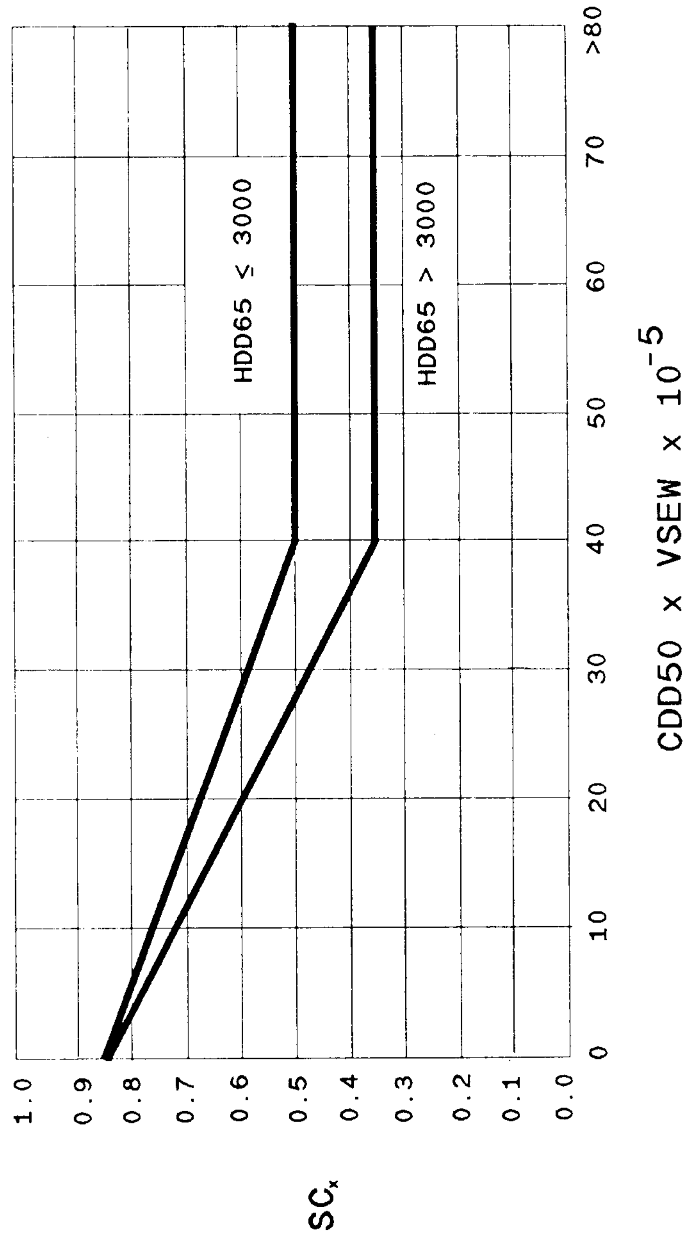
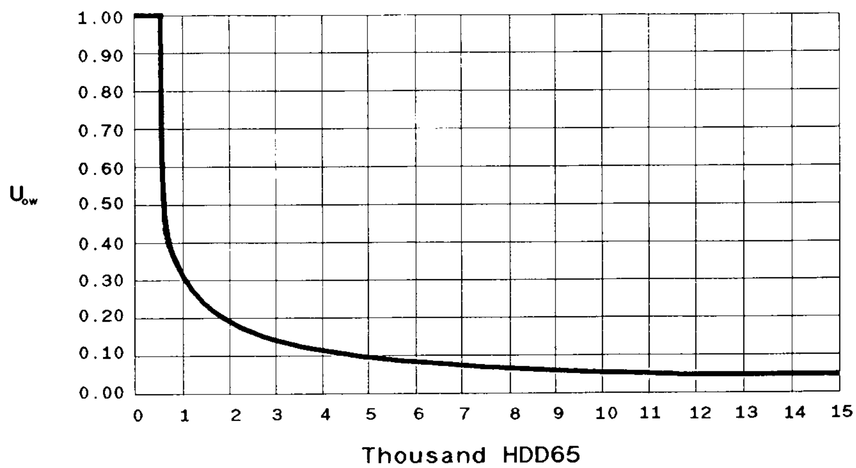


Figure 5B-4

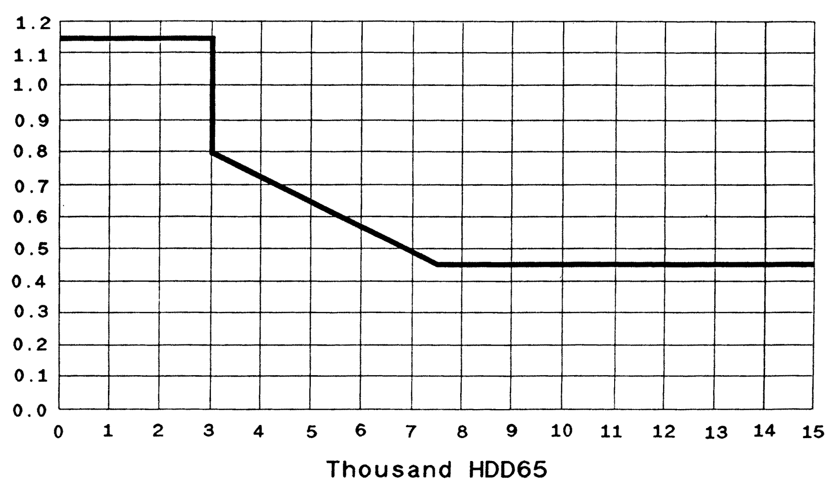
Overall Thermal Transmittance of Opaque Wall Sections



Note: for HDD65 < 196, $U_{ow} = 1.0$
for $196 \leq$ HDD65 ≤ 15000, $U_{ow} = 42.787/\text{HDD65}^{0.712}$

Figure 5B-5

Maximum Overall Thermal Transmittance of Fenestration Assemblies



ATTACHMENT 5C TO 435.105
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Volume 3: Description of the Testing Process; Appendix B: Envelope Compliance Code Documentation.

Volume 4: Documentation of Test Results: (Each in 3 volumes): A: Small Office Building (Branch Bank); B: Medium Office Building; C: Large Office Building; D: Retail Store (Anchor Store); E: Strip Store; F: Apartment House; G: Hotel; H: Warehouse; I: Assembly Building (Church); J: School.

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§ 435.106 Electric power and distribution.

6.1 General

6.1.1 This section contains minimum requirements for all building electrical systems, except required emergency systems.

6.1.2 A building shall be considered in compliance with this section if the minimum requirements of section 6.3 are met.

6.2 Principles of Design

6.2.1 Electric Distribution Systems

6.2.1.1 Transformers and generating units shall be sized as close as possible to the actual anticipated load (i.e., oversizing is to be avoided so that fixed thermal losses are minimized).

6.2.1.2 Distribution of electric power at the highest practical voltage and load selection at the maximum power factor consistent with safety shall be considered. The use of distribution system transformers shall be minimized.

6.2.1.3 Tenant submetering can be one of the most cost-effective energy conservation measures available. A large portion of the energy use in tenant facilities occurs simply because there is no economic incentive to conserve.

6.3 Minimum Requirements

6.3.1 Electrical Distribution System

6.3.1.1 All commercial or multi-family high rise residential buildings, having designed connected electric service over 250 kVA, shall have electrical energy consumption check metered on the basis of usage category or tenant occupancy, depending on conditions defined below. For buildings that are occupied by multiple tenants, the metering shall be per tenant, if the tenant has a connected load of 100 kVA or more. HVAC and service hot water systems, shared among tenants, need not meet this requirement but shall be separately metered.

6.3.1.2 The electrical power feeders for each facility for which check-metering is required shall be by tenant and shall be subdivided in accordance with the following categories:

6.3.1.2.1 Lighting and receptacle outlets;

6.3.1.2.2 HVAC and service water heating systems and equipment; and

6.3.1.2.3 Special occupant equipment or systems of more than 20 kW, such as elevators, computer rooms, kitchens, printing equipment, and baling presses.

6.3.1.2.4 *Exception to Section 6.3.1.2:*

(a) 10% or less of the loads on a feeder may be from another usage category.

6.3.1.3 The power feeders for each category shall contain portable or permanent submetering prior to or within any primary or secondary distribution panels. Such provisions shall include a separate compartment or panel of adequate size and design to house the necessary voltage and current transformers. An accessible means of attaching clamp-on meters or split-core current transformers shall be provided.

6.3.1.4 The locations of these points of measurement may be central or distributed throughout the building, as